Mobile Suit Gundam :
After Fall of Axis
Final Report

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Executive Summary

This report includes objective, background, functional and non-functional features, evaluation, and conclusion in detail.

This is a soul-like 2D shooter game, aimed to challenge players and bring them a reflection through story. In this game, the player can control the main character, Arx 7, to complete the mission. Before starting the mission, the game will display the story of the game, the player will know the story and the objective of the mission.

After the slide is shown, the player will go into the weapon selection, where the player can change the weapon position and choose the weapon to carry to battle. There is a weighting system, which lets the player debuff when they carry many weapons and ammunition. After choosing the weapon, the game started. The player cannot see the exact health point they have, but only see the character turn when hit. Also, there is a temperature system which may make the game easier or harder. After beating the enemies, the player will enter the boss room, and start the hardest battle.

We had done many testing to find the balance of the weapon damage and the enemy damage. Also, every skill of the boss and the main character have been tested properly to minimize the error. During the project, there are three problems that have been found and discussed, we also make a suitable solution for every problem to prevent the problem from occurring again.

Introduction

Objective

The game is a soul-like 2D shooter game which provides an extremely challenging gameplay experience. The target users are hardcore player and fan of robot animes as this game is going to restore abilities and limitations of classic giant robots. Anti-war reflection will also be delivered through the story.

Background

The story is based on the movie Gunbuster(1988) and Gundam series. The main idea of it is to describe how the corrupted government would react to an unfamiliar power and soldiers, bringing out the idea that politics and war are cruel, it should not be exciting and entertainable.

The player will be fighting for the government, the purpose of it is far from justice as war is always just conflicts of interest.

Functional features

Main Character

Player will control the main character, Arx-7, from the Full Metal Panic series (1998).
It contains basic actions such as running, jumping and different attacks with weapons
selected by the player.

A special mode named as "Lambda Driver activated" is provided for further
functions. The player can charge the shotgun for shield piercing and melee attack for
higher damage, ammo recovery. An auto-react energy shield will also be activated for
defending ordinary bullets, lasers, and melee attack of the enemies.

Normal Form

Lambda Driver activated (Special Mode)

Charged Melee Attack

Auto-react energy shield

Story Display system

After the player clicks the start button, slides will be shown automatically. There are few sentences to describe the story below the image. The player can also skip the current slide manually by clicking the left mouse click.

Light of human and heart covered earth after the miracle

Health Point system

Health Point (HP) will not be displayed in game. HP will decrease when the character is hit by projectiles, such as bullets or lasers, and turn the character in red as a sign that HP has been decreased. Enemy disappears when the HP is equal to or below zero. If the player's HP reaches zero, then the game will show the death screen and return to the game title.

Temperature system

Player's temperature will be displayed on the top left corner in the game. The temperature will increase when the player is in special mode and hit by the enemy. Once it reaches the maximum temperature value, it will overheat, and the player cannot control for a few seconds as a penalty. Temperature will decrease when the player stops moving. Boss has the same feature as the player.
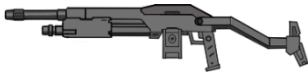
Weapon Selection system

The carrying items can be chosen at the beginning and set the maximum ammunition size automatically. During the game, players can collect the ammunition by using the charged melee attack. Weight will decrease mobility (running speed, height of jumping, etc) by percentage. Using the belongings will decrease the weight and showing at the weight bar.
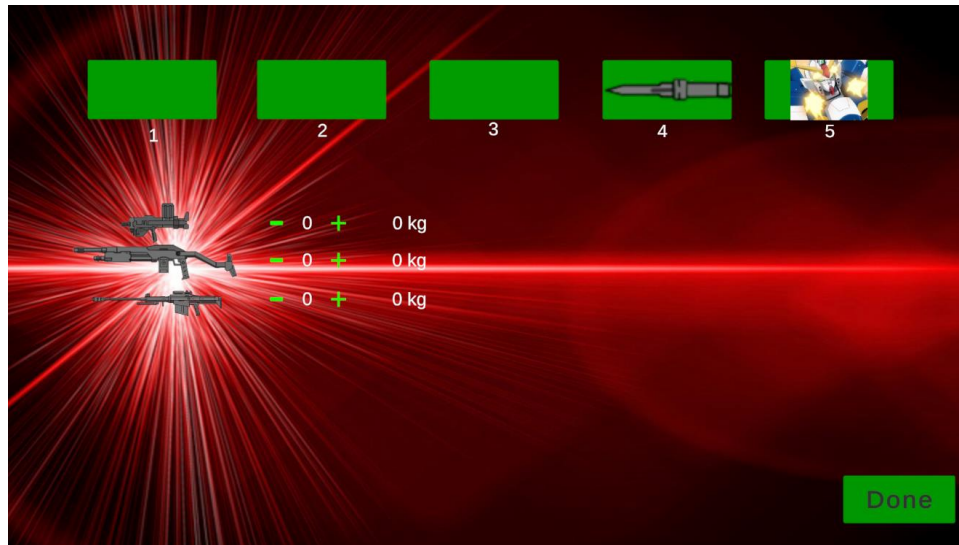
The players can also change the weapon position in this menu, each position has one shortcut, which allows the players to switch the weapon.

Weapon List

There are six weapons in total, three of them are default weapons, which the player must carry to the battle. The remaining weapons are optional weapons. Each of the weapons have different attack damage, maximum ammo value, attack cool down and weight. Weapons can be chosen in the Weapon Selection system. The followings are the list of weapons that the player can use in the game:

| Weapon Name	Weapon Figure	Description
"Boxer" 57mm Shotcannon		Live-ammunition with heavy damage. It is chargeable in special mode.
40mm submachine gun		Full-auto live-ammunition weapon with high rate of fire.

ASG96-B 57mm smoothbore gun		Armour-piercing live-ammunition weapon. It can only be used when standing.
Anti-tank dagger		Throwable weapon, explosive when it hit a target.
GRAW-2 Monomolecular Cutter		Melee attack, it is chargeable in special mode and release charged melee attack. Killing the enemy with charged melee attack will recover all the ammunition of other weapons.
12.7mm Chain Gun		Defensive live-ammunition weapon, shooting from the head.

Weighting system

The weighting will affect the player's movement speed When the player selects more weapons and ammo into the battle, the weight of the player will increase accordingly. The player can also reduce the weight by using the ammo.
Weighting will show below the temperature bar. The figure on the left shows the weight bar with ammo, and the right-hand side shows the ammo drop, the weighting bar will decrease.
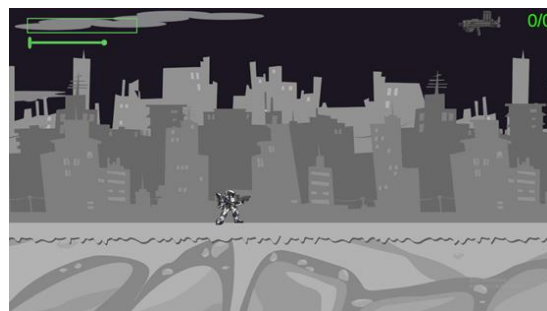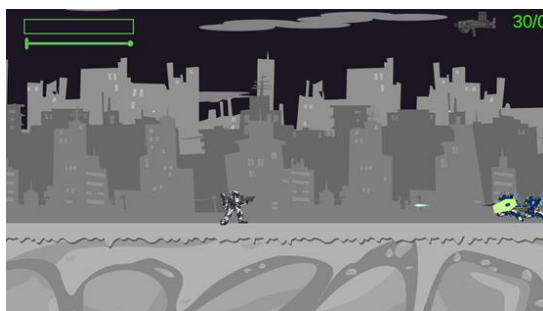
Boss

The boss of this game is Gunbuster, from the movie Gunbuster (1988). The height of it is twice the player character.
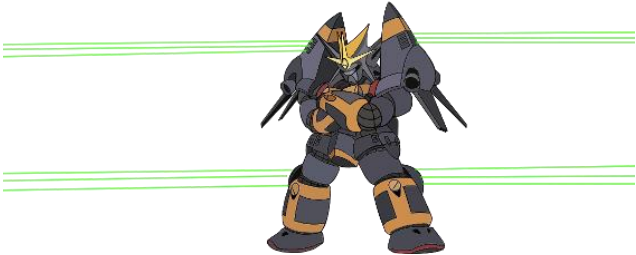

Gunbuster

Comparing Figure

The boss has several attack methods during the battle, and the boss will attack with a second cool down. The following are the skills of the boss:

	## Super inazuma kick Super inazuma kick is a special skill which makes the boss jump to the top of the player and kick down. By doing this attack, the boss will switch to jumping animation and do a high jump. Then switch to kicking animation and drop down from the top of the player with high speed, damaging the player if has been kicked by the boss.
	## Grabbing Grab attack, boss will have pre-grabbing animation before grab attack. After the animation, the boss will move forward with a few distances. If the player enters the hitbox of the grab during the movement, the player will be grabbed by the boss, and will receive damage.

	# Head Laser Beam Attack Shooting a purple laser beam from head and rotating the laser with 60 degree. If the laser hits the player, the player will knock back for a second.
	# Arm Laser Beam Attack Arm laser beam attack is a quick attack skill which shoots green lasers to the front and back from shoulder and knee.
	# Missile attack Shooting missile from finger, which will stop following the target after a couple of seconds. Each missile can deal damage to the player when it hits the player. After all the missiles disappear or hit the target, the boss will start the next attack immediately.

Non-functional features

Frame rate

Most of the desktop games are at least 60 frames per second(fps). The game will also set the frames rate as 60 fps and allow the player to address to a higher frames rate.

Usability

The character can be controlled with the keyboard only. All the control keys can be addressed in the setting of the game.

Response time

This game is an action game, the player needs to react to the enemy attack and make a response as soon as possible. Except the player reaction time, the response time is also important. The game will keep the response time below 10 milliseconds.

Required resources

This game may need a minimum 2048 MB of RAM and 425 MB of hard disk space to run smoothly. As this game is still implemented, the resources may increase.

Platform

The game can be run on a 64-bit Windows platform.

Loading

The average transition time and loading time with an average ten seconds.

Evaluation

Main Character

After implementation, we tested the character action with the corresponding input key. Every action and interaction with the enemies have been tested in the game, and for some special actions, such as overheat, injury, charged melee attack or shield defence, it will show the corresponding particles at the same time.

From left to right, moving left, moving right, jumping, special mode, injuring, melee attack, shielding, knocking back, charged melee attack, overheat.

Main Menu

After the implementation of the main menu, we tried to build the whole game and run the game. We tested the option menu with different resolution, fps, quality, etc., and the control key.
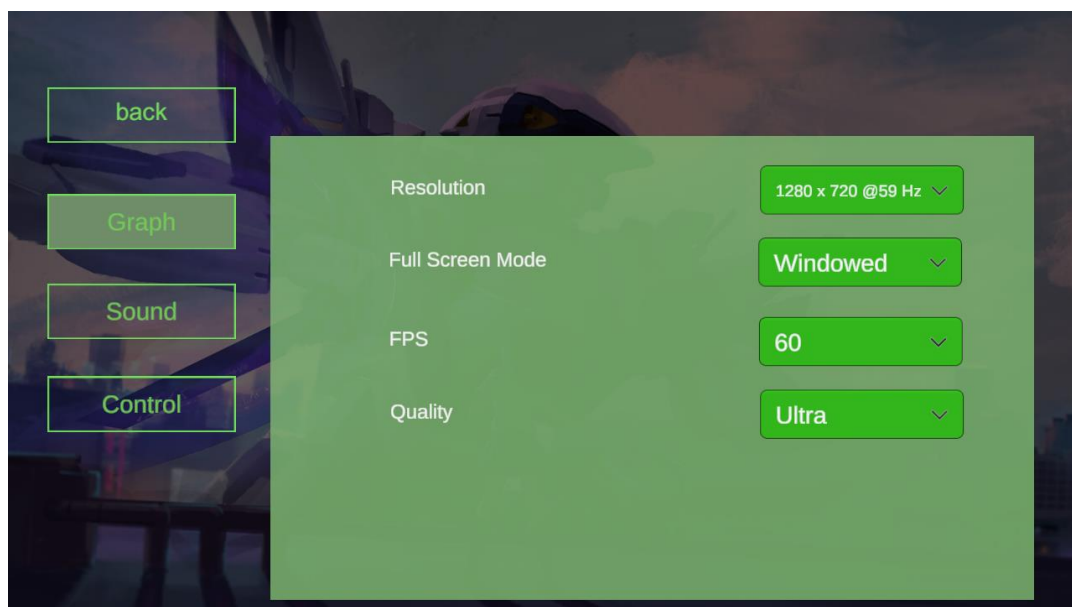
For example, we tried to use the "Left Arrow" key to control the left movement and the "Right Arrow" key to control the right movement. After changing the input key, we go into the game and test the key work properly or not. We had tried about five keys for every changeable button.

Story Display system

This test mainly focuses on the image that can be shown automatically with a given time, five seconds. Also, we tested the story can be skipped by clicking the left mouse button. Apart from the slide, we tested the background music can play properly.
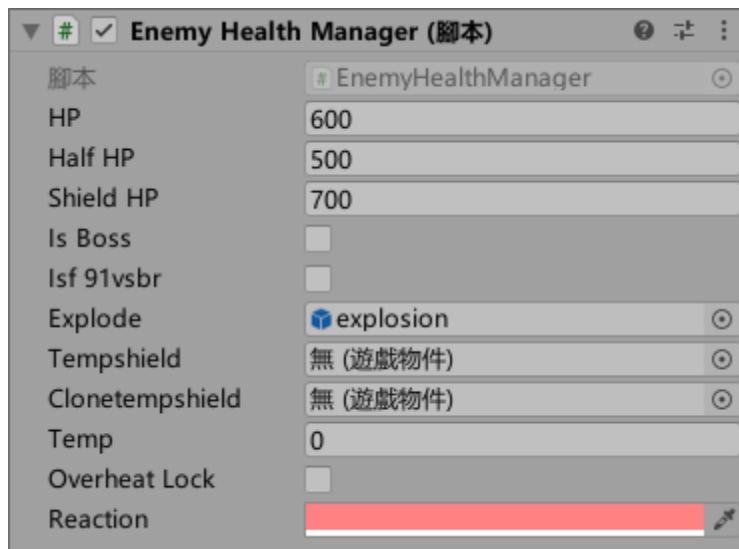
Health Point (HP) system

There is no HP bar in the user interface, but there is an invisible variable in the unity to calculate the HP. We tested if the variable reaches zero, will the dead screen show properly.

There is also an enemy health manager in the enemy side to calculate the HP of enemies. We also tested if the value reaches, the enemy will disappear or not.

Temperature system

We tested the temperature system by taking damage from the enemies in special mode. The temperature bar will increase when hit by enemies. We also tested when the temperature reaches the maximum, will it overheat or not, and the "OVERHEAT!" can show properly or not with the correct particles. The figure on the left below is the temperature increase after being hit by enemies, and the figure on the right-hand side is overheating.

Weapon Selection and Weighting

system

In unity, we have tried every weapon with different weapon position and mag amount. There is an array called "Ammo" on the bottom left of the figure below, which represents the mag amount in the corresponding weapon position. The array below "Ammo" is the weapon position with weapon code, such as code 0 is the submachine gun, code 1 is the Shotcannon, etc.
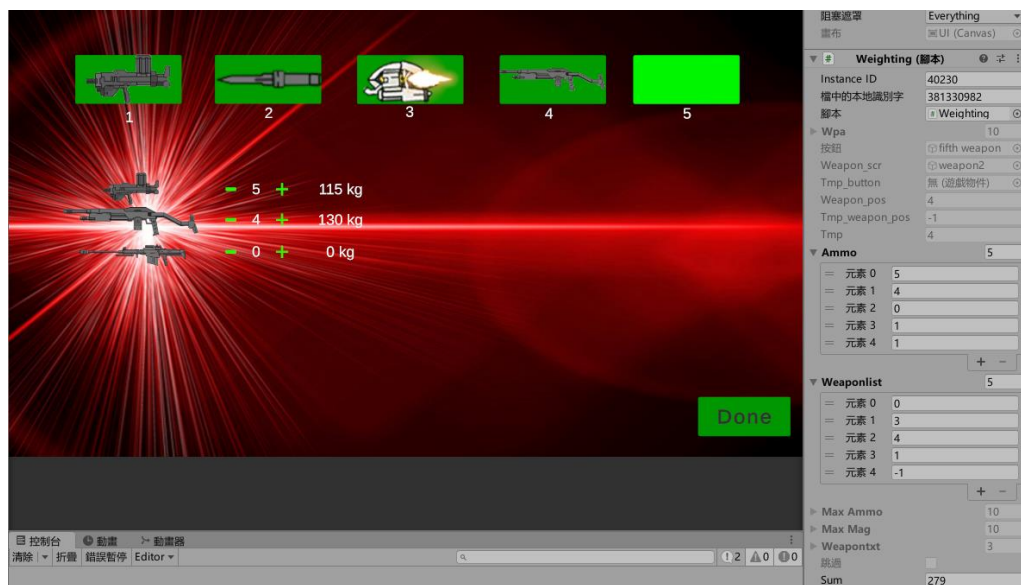
We also created an excel to calculate the weight of every weapon and total weight. The sum of the excel is the same as the sum of the game.

| Arx7								
name	ammo	maxAmmo	Mag	Max Mag	weight	weight per ammo	total weight	carried?
smg	0	30	5	10	40	0.5	115	1
Shotcannon	0	5	4	8	60	3.5	130	1
sniper	0	3	0	4	90	5	0	0
			FIXED					
anti-tank dagger	0	2	1	0	0	7	14	
Chain Gun	0	200	1	0	0	0.1	20	
							Sum	
					Original Speed	kg/1% lost	279	% of original speed lost
					1200	8		0.34875
						Speed =	781.5	

In the game, we also had the column to show the current weighting and speed in the game. We tried all the ammo amount and weapon in the game and compared with our excel file to check if the program is correct or not.
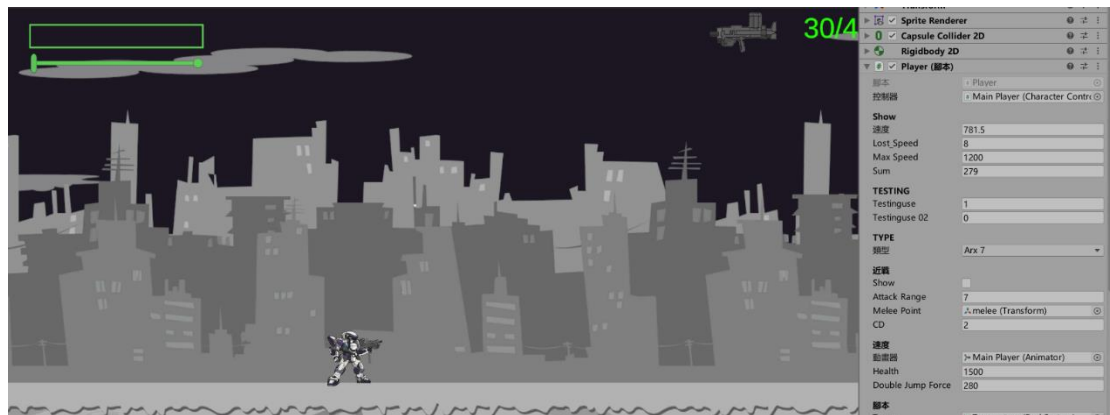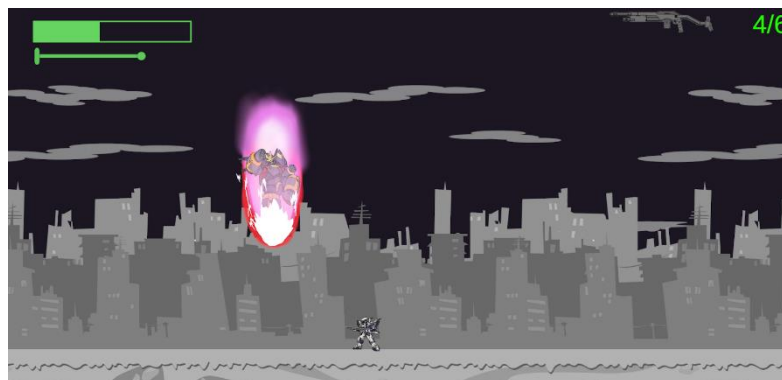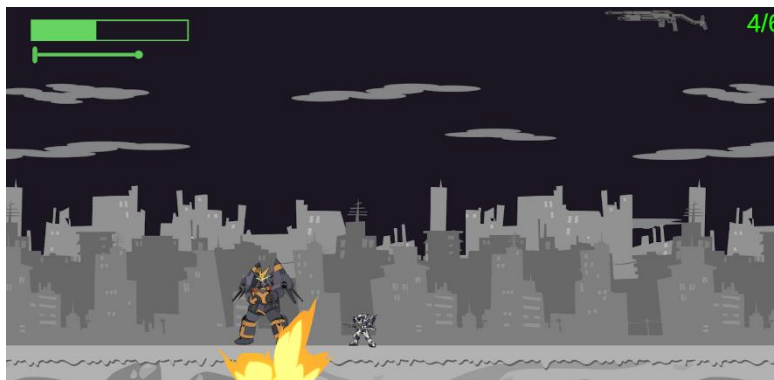

Boss

After implement the boss skill, we started to test every skill, by testing the hitbox, cooldown time, animation changing, etc.

Super inazuma kick
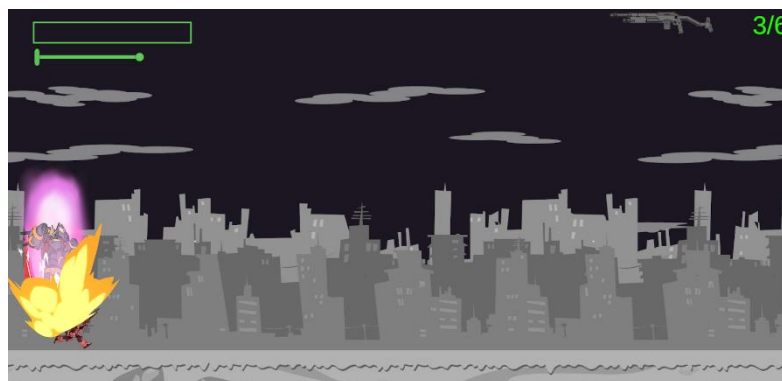
The character has turned into red due to the super inazuma kick, which mean the player has enter the hitbox of the super inazuma kick.

When super inazuma kick is landed on ground, it will also trigger the explosion but not dealing any damage to the player.
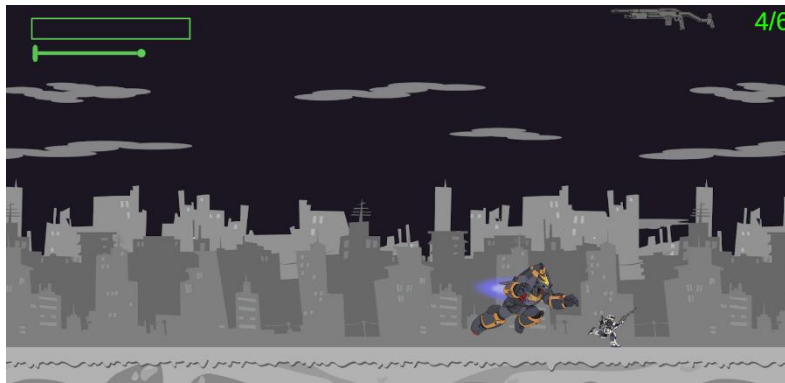
Grabbing

This is the pre-grabbing animation.

Grabbing will hit when the boss and the player are close enough.

The hitbox of grabbing is small, we are testing whether the player is able to run away or not.
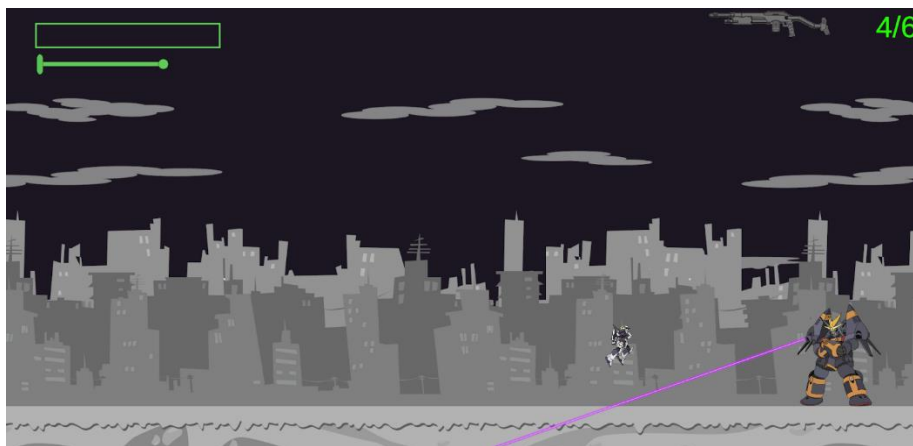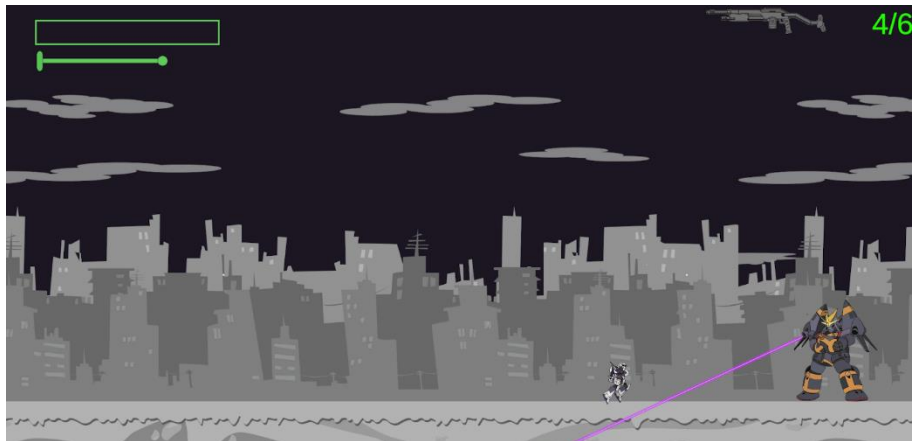
Head Laser Beam attack

We tested the laser can hit the player will the laser is overlapping the player properly or not.

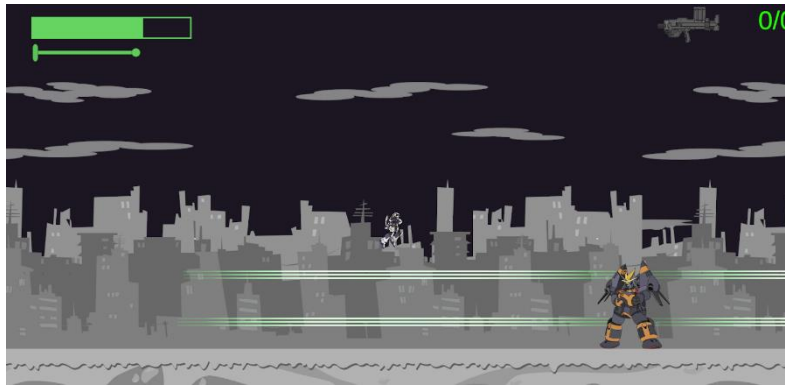Also, we tested the knock back animation occurs after dealing damage.

Also, we tested can the jumping dodge the laser.
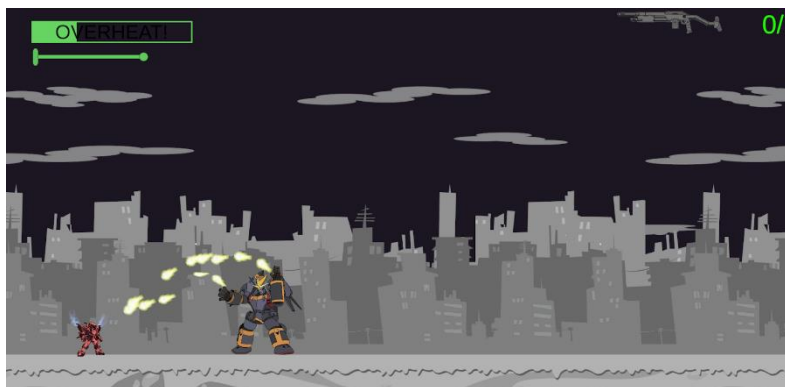
Arm laser beam attack

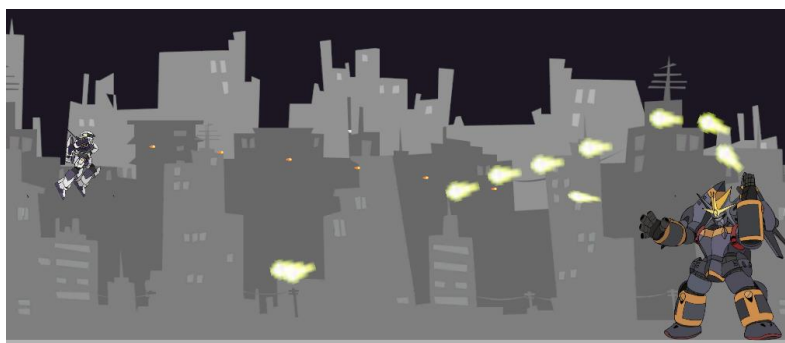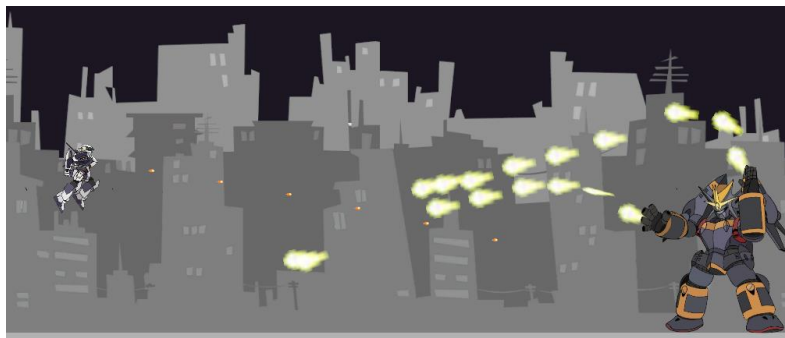We tested the arm laser beam deal damage to the player when it hit the player.

We tested the player can dodge the attack by using double jump.

Missile attack

We tested the missiles can follow the player and hit the player.

And we also tested those missiles can be destroyed by player's bullets.

Conclusion

Problems & solutions

First, as we are all new to unity, all the coding and editing need time to study. The programming language using in unity is C#, which is also new to us. As a result, our project process is slow at the beginning.

During the implementation, we tried to solve the problem in order to improve our process. We tried to divide our teammates into two groups, the first group study about controllable character, and the second group study about enemy side. After dividing our teammates, the process improved.

Second, our designer is new to drawing software and need to get used to them in order to make improvements. The production at the beginning is behind schedule, due to the limitation of drawing skill and unfamiliar with tablets. This made us cannot produce some of the planned features.

As we cannot meet the schedule, we needed to reduce some planned features, for example, levelling design, elite enemy, two bosses and the second controllable character(F91). Leaving only one character (Arx-7) for the player to control and changing the second character(F91) into the enemy side.

Third, our team has lost many drawings including the body parts of the character and draft drawing, due to our designer upgraded his computer without backup. It had taken one month for recovery and redrawing all the missing frames and figures.

After the data loss mentioned before, we started to upload everything into Google cloud for preventing any extra loss of data again.
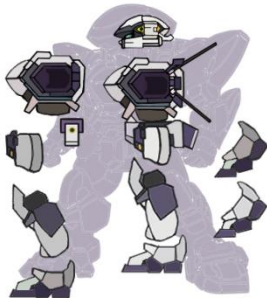
Drawing

Standing (16 frames)

Idle standing and attacking animations were performed with multiple layers.
Separating into body and different hands for corresponding weapons or poses.

Movement (87 frames)

The designer drew the body parts for Arx-7 to develop the movements.

Movements of Arx-7 were also produced separately. For example, running animations were separated into left hand, right-hand and body in order to handle different weapons' animations without rebuilding the whole frame.

All right-hand animations can directly cover the character for any action, which can let the character attack any time whenever it is running or jumping.

F91 was also implemented with the same method for handling the shield and weapons.

Special cases (11 frames)

There are cases that cannot be simply built with body parts, so they were drawn individually. Most of them were the boss's attacks and the charged melee attack of the main character. The designer also tried to draw some special effects himself.

To conclude, 114 frames of animations and pictures were built by the designer in this project.

Appendices

Characters and weapons:

    Arx-7 from Full Metal Panic (1998)

    F91 from Mobile Suit Gundam F91 (1991)

    Gunbuster from Gunbuster (1988)

Explosive animation

    Alex Redfish,

    https://drive.google.com/drive/folders/1kHRGlmTKCoyKE_cBk7NGzv1C8iw4p50

    A

Background:

    Full Metal Panic (1998)

    mobile game graphics, https://mobilegamegraphics.com/

Sound effects:

    Zapsplat, https://www.zapsplat.com/

    Fesliyan Studio, https://www.fesliyanstudios.com/

Music:

    M9 and Shissou, Full Metal Panic (1998)

    Gunbuster march, Fly high from Gunbuster (1988)

    Judau in space, main theme from Gundam series

Bullet images:

    Freepik, https://www.freepik.com/free-vector

Unity tutorial:

    Brackeys, https://www.youtube.com/user/Brackeys

    Code Monkey,

    https://www.youtube.com/channel/UCFK6NCbuCIVzA6Yj1G_ZqCg

    Unity API, https://docs.unity3d.com/ScriptReference/