# GDD

# system overhaul


Faculdade de Design,
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SPLIT HEAD STUDIOS

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# 1. Introduction

## 1.1 Overview

Play as a character with a helmet in a futuristic city and save the world from a dictatorship by exploring areas, solving puzzles to enter restricted zones, and killing enemies.

## 1.2 Concept

System Overhaul is a 3D Single-Player, third-person Action-Adventure game for Windows and macOS.

Some of the games that System Overhaul draws inspiration from are

- Risk of Rain 2 (2020) - for the camera perspective
- Necropolis (2016) - for the environment and camera perspective
- Shadow of the Tomb Raider (2018) - for the puzzles and the radar ability.
- Cyberpunk 2077 (2020) - for the futuristic environment

## 1.3 Story

On another distant planet, where everyone wears helmets to identify their faction and aid them in their everyday life through the use of AI that's built into the helmet. Once civilization started to evolve, someone took it as a chance to get power and became the first dictator on the planet. After that, the dictator divided people into different areas. Some years later, the main character, Robert, decided that they had enough and would fight against the system and the people in power.

## 1.4 Target Audience

Fans of single-player Action-Adventure and Futuristic games.

## 1.5 Platform

The target platforms for the game are Windows PC and macOS.

## 1.6 Player Goal

The main goal of the game is to explore and clear off all the enemies from the areas in the city and break the system from a dictatorship.

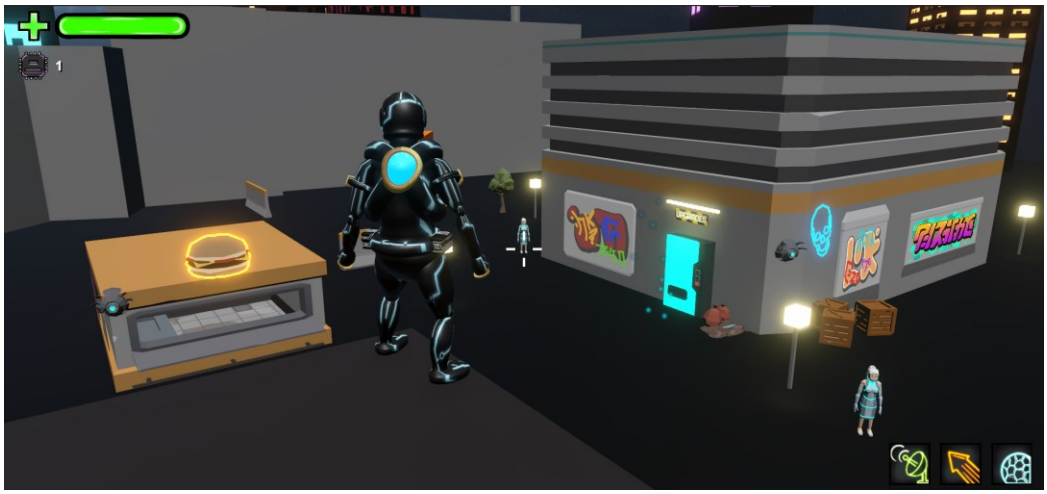
# 2. Gameplay

## 2.1 Camera

The camera shows a third-person perspective of the player character. The third-person perspective allows the player to get a wider view of their surroundings at all times.

The player can use the mouse to rotate the camera horizontally and vertically depending on whether the mouse is moved horizontally and vertically respectively. The character rotates instantaneously with the camera.

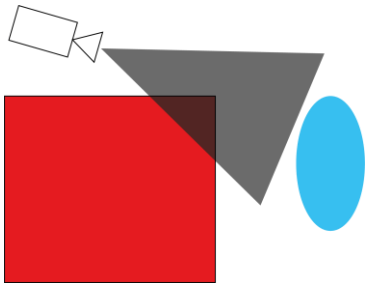
The character will move relative to the direction in which the camera is facing.

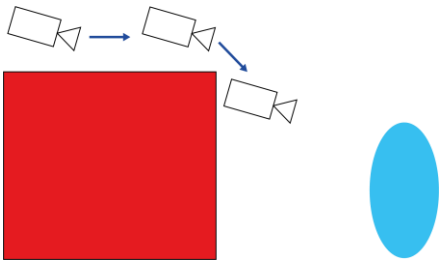


Reference Image

### 2.1.1 Camera Collisions

If the camera collides with an object, it will move/slide forward towards the player so that they are always in the camera's view and objects don't end up blocking the player's view.





## 2.2 Player

The player controls a character with a helmet who has a ranged weapon: a futuristic gun, they can jump, crouch, see enemies through walls, shield themselves and collect computer chips to upgrade abilities.S

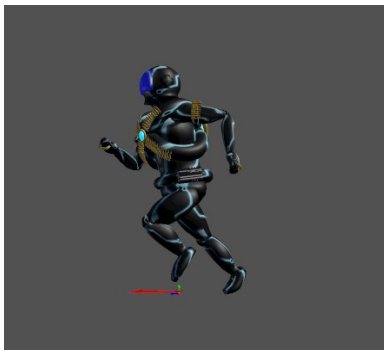
The player's Ai helmet allows the player to see their health and abilities.

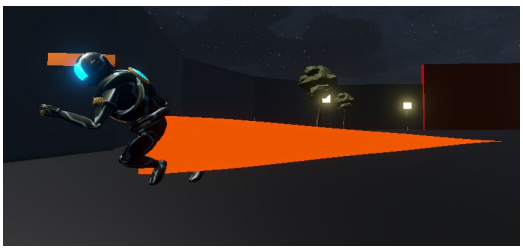
As the game is a 3D game the player will be affected by gravity.

Reference Image

### 2.2.1 Movement

The player is able to move on the x and z-axis, he will walk with a speed of 5 and run with a speed of 10. The player can also Dash, which leaves a trail behind by using trail renderer.





### 2.2.2 Jump

The player has the ability to jump keeping horizontal momentum and for a fixed height.

### 2.2.3 Crouch

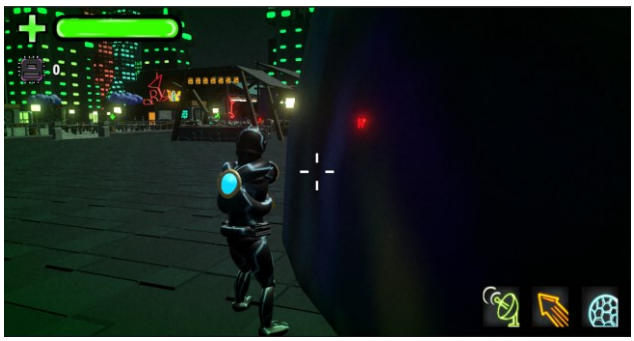
The player can bend down their knees to reduce their height, allowing them to dodge the enemy´s projectiles, make themselves less visible, or enter compacted spaces.

### 2.2.4 Radar Ability

The player has the ability to see highlights of the enemies to help them navigate through areas.

We will be using a shader for when the player uses the radar ability. When in use the enemies will be outlined in red. For the third delivery, the enemies' chest gets highlighted in red. A post-processing effect will also be activated making the edges of the screen green and adding some gairn.

Reference for the Radar Ability



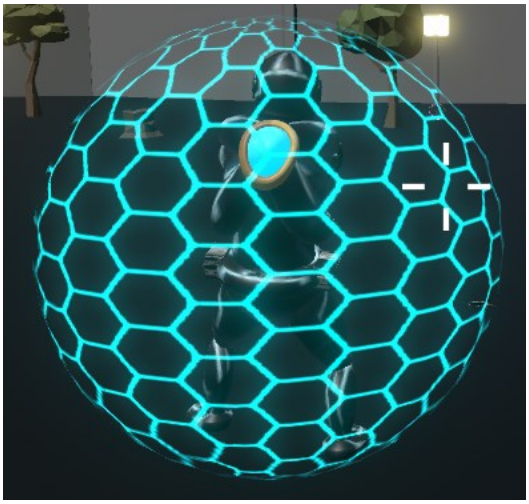
### 2.2.5 Checkpoint Zones

The player will encounter checkpoints throughout the game, if the player dies they will respawn in the latest checkpoint they passed through. If the player dies without reaching any checkpoint, they will respawn at the start. The particles on the checkpoints get destroyed after the player collides with the checkpoint.

### 2.2.6 Block/Shield Barrier

The player can block any incoming damage for a short time by using a shield barrier. A shader will be used for the shield Barrier.

- Duration: 3 seconds
- Cooldown: 5 seconds

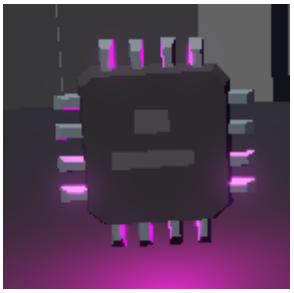


Reference Image for the Barrier.

### 2.2.7 Pickups

The player can find chips throughout the map that can be used to upgrade the character's helmet, giving him improved abilities.

The green crosses have a shader making them move up and down to give an impression that they are floating.

| Pick-ups | Description | Icon |
|---|---|---|
| **Computer chips** | Used to buy/unlock upgrades for the character |  |
| **Green HP icon** | Restore Health Points |  |

### 2.2.8 Health

The player has 100 health points. If they lose some health the player will start to restore some health back slowly over time once they aren't in battle.

If the player gets hurt, a post-processing effect will be triggered that will make the edges of the screen red. The lower the health of the player gets the darker the red color becomes.

In-game image of the health bar


In-game image of the post-processing effect

### 2.2.9 Upgrades

The player will be able to do upgrades at vending machines, for the vertical slice we will have 3 upgrades.

The player will be able to upgrade his ranged damage, increase his speed while using the dash ability and increase the duration of the shield barrier. The player will only be able to do each upgrade once.

| Upgrade Name | Description | Cost |
|---|---|---|
| Melee Damage (Removed) | Increases the amount of damage that the player gives when using his sword | 5 chips |
| Ranged Damage | Increases the amount of damage that the player gives when using his gun | 3 chips |
| Shield Barrier Increased Duration | Increases the duration of time that the player can use the shield barrier | 5 chips |
| Dash Ability Speed | Increases the speed that the player moves at while using this ability | 5 chips |

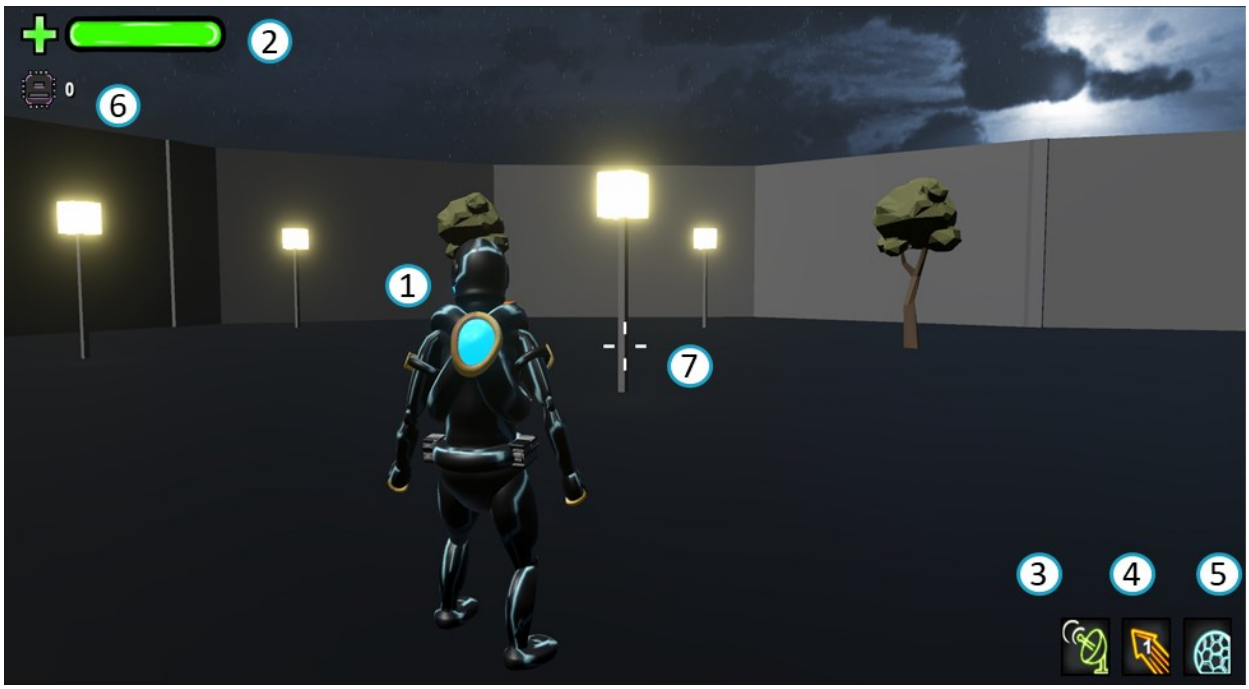

In-game image of the vending machine


In-game image of the vending machine

## 2.3 Player Controls

| Key binds | |
|---|---|
| **Bind** | **Description** |
| A | Strafe left |
| D | Strafe right |
| W | Walk Forward |
| S | Walk Backwards |
| Space | Jump |
| E | Shield Ability |
| F | “Interact” |
| Mouse Scroll Wheel (Removed) | Change Melee to Ranged Attack or vice-versa |
| Left Mouse Button | Attack |
| Left Control | Crouch |
| Q | Radar Ability |
| Esc | Pause/Unpause |

## 2.4 User Interface




**Caption:**

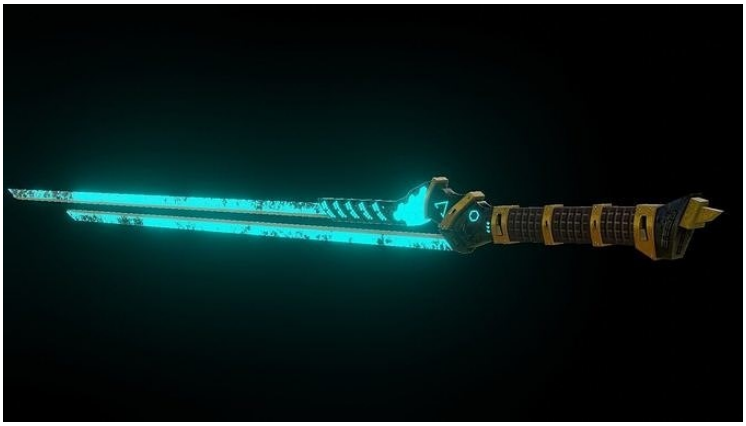
1. Player-Character
2. Heath Bar
3. Radar Ability
4. Dash Ability
5. Shield Ability
6. Computer Chips Amount
7. Cursor

## 2.5 Weapon

The player uses his gun to kill enemies to clear the areas of the city. A ranged weapon is the only weapon the player has at their disposal.

### 2.5.1 Melee Weapon (Removed)

The melee weapon is a close-ranged weapon that deals more damage than the ranged weapon. This weapon knockbacks enemies backward. This weapon looks like a futuristic sword that has lights on its blade.

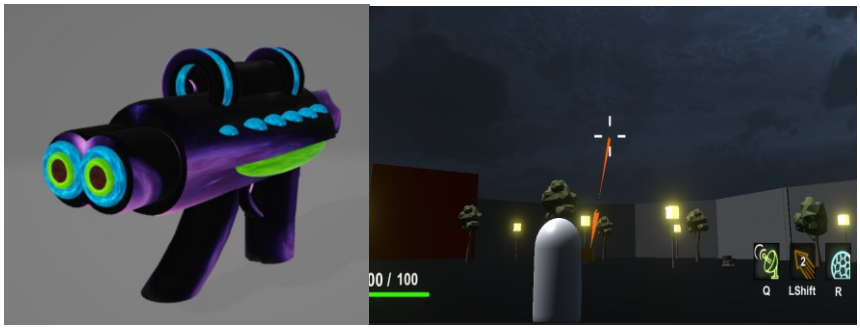


Reference Image

### 2.5.2 Ranged Weapon

The ranged weapon is a medium to a long-range weapon that shoots projectiles. This weapon uses energy instead of bullets, so there is no need to reload the gun. The ranged weapon projectiles shoot in the direction of the mouse cursor.

For the trail that the projectiles leave we will be using particle systems.



# 2.6 Enemies

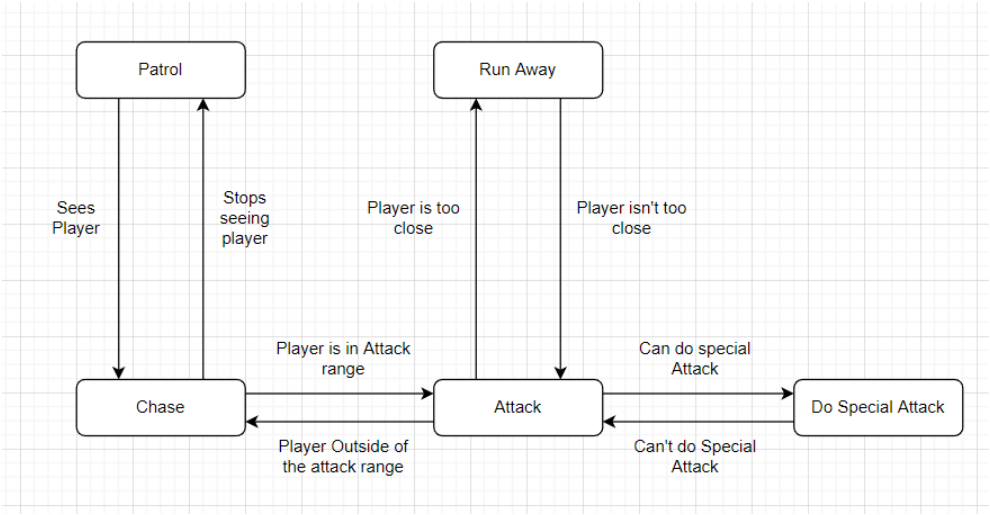
## 2.6.1 Ranged Enemy

Ranged enemies keep their distance from the player and use ranged weapons (guns) to deal damage to the player. Ranged enemies deal 10 damage to the player.

The ranged enemies will always try to maintain a certain distance from the player, if the player gets too close they will try to move away.

For the ranged enemy AI,  we created a finite state machine. Right now our state machine has 3 states, patrol, we used unity's navmesh system for it, chase and attack. We will also add more stages, one for when the player gets too close to the enemy and he will try to keep his distance. Also, we will add a different attack that will make the ranged enemy release a bigger energy bullet, from time to time, that will cause more damage to the player.

We also implemented the look at target steering behavior.




Ranged Enemy Finite State Machine Diagram

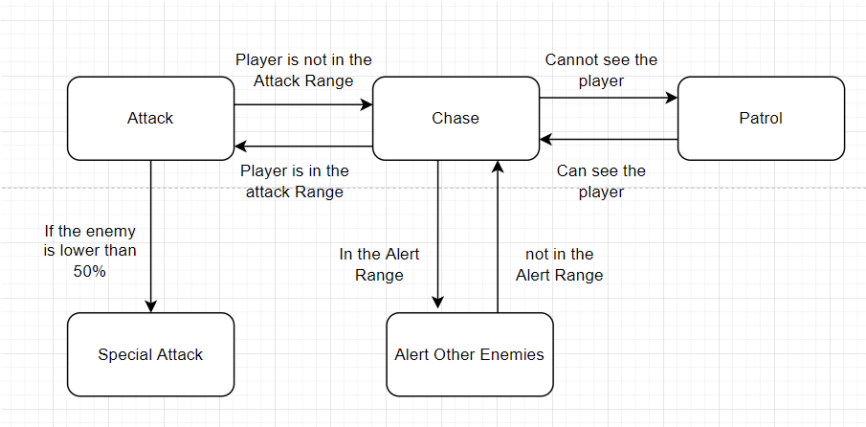
Image of the in-game 3D model

### 2.6.2 Melee Enemy

Melee enemies try to close their distance from the player as fast as possible and attack the player with their fists.

Melee enemies deal 15 damage to the player.

For the melee enemy AI,  we created a finite state machine. Right now our state machine has 3 states, patrol, we used unity's navmesh system for it, chase and attack. Melee enemies will alert other enemies in the area if they see the player and those alerted enemies will rush in to attack the player. If the melee enemy's life is below 50% he will start to do a special attack instead of the normal attack. As well as the look at target steering behavior.



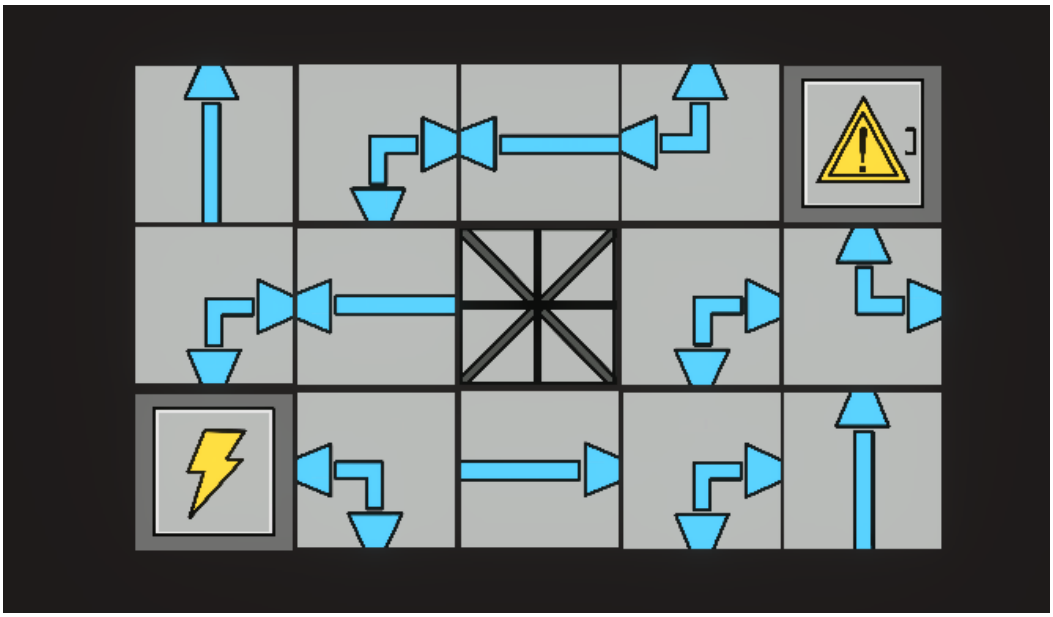

Melee Enemy Finite State Machine Diagram

Image of the in-game 3D model

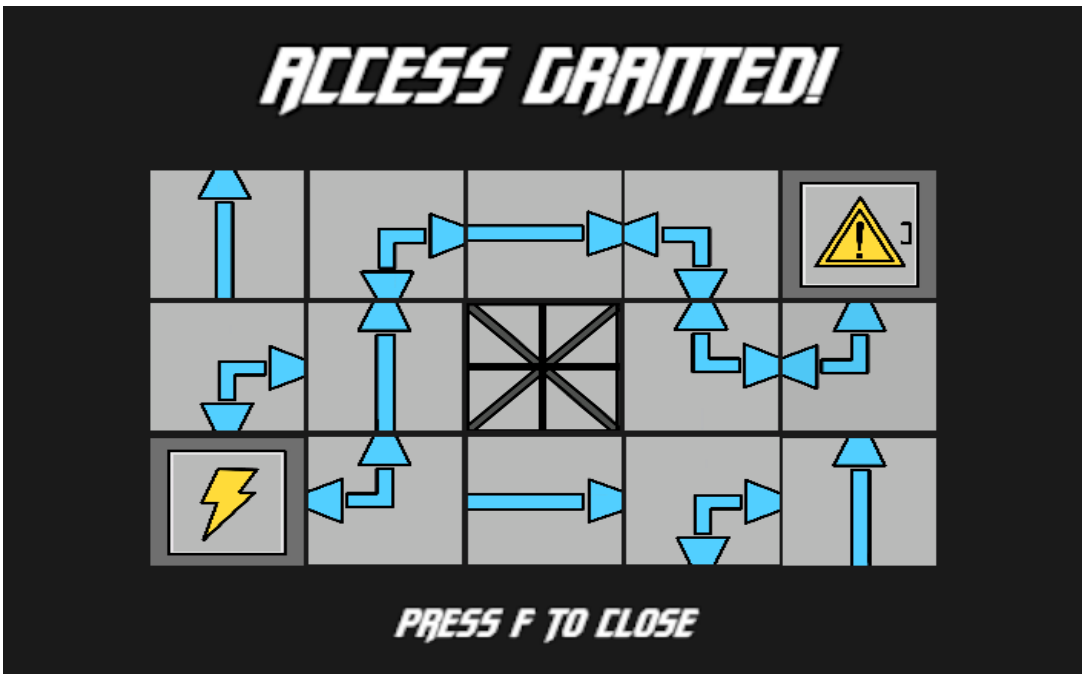
## 2.7 Puzzles

Some areas in the game are locked and to unlock them, the player will have to access a terminal and complete a certain puzzle. Puzzles consist of rotating lines and connecting them.

In-game image of the terminal



Puzzle 1 - Rotate the lines in the white squares to connect all the lines




Puzzle 1 - Solved

## 2.8 Friendly NPCs

The friendly NPCs will be walking around the area, and the player won't be able to interact with them.

The friendly NPCs AI will be steering behaviors, they will walk around the world, to random positions, and if the player isn't in a fight and gets close to them the friendly NPCs will say a random phrase.

For the AI of the friendly NPCs, we used steering behaviors. We used wandering, looking in the direction so that they would always look to where they are moving, collision avoidance, and obstacle avoidance so that they can detect obstacles such as walls and buildings and avoid colliding with them. We will also say phrases when the player gets close to them, these phrases will be random and will be only audio.

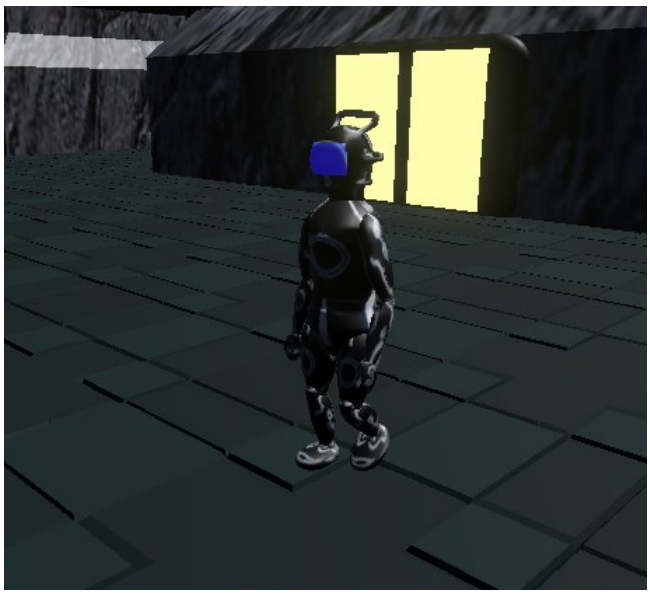
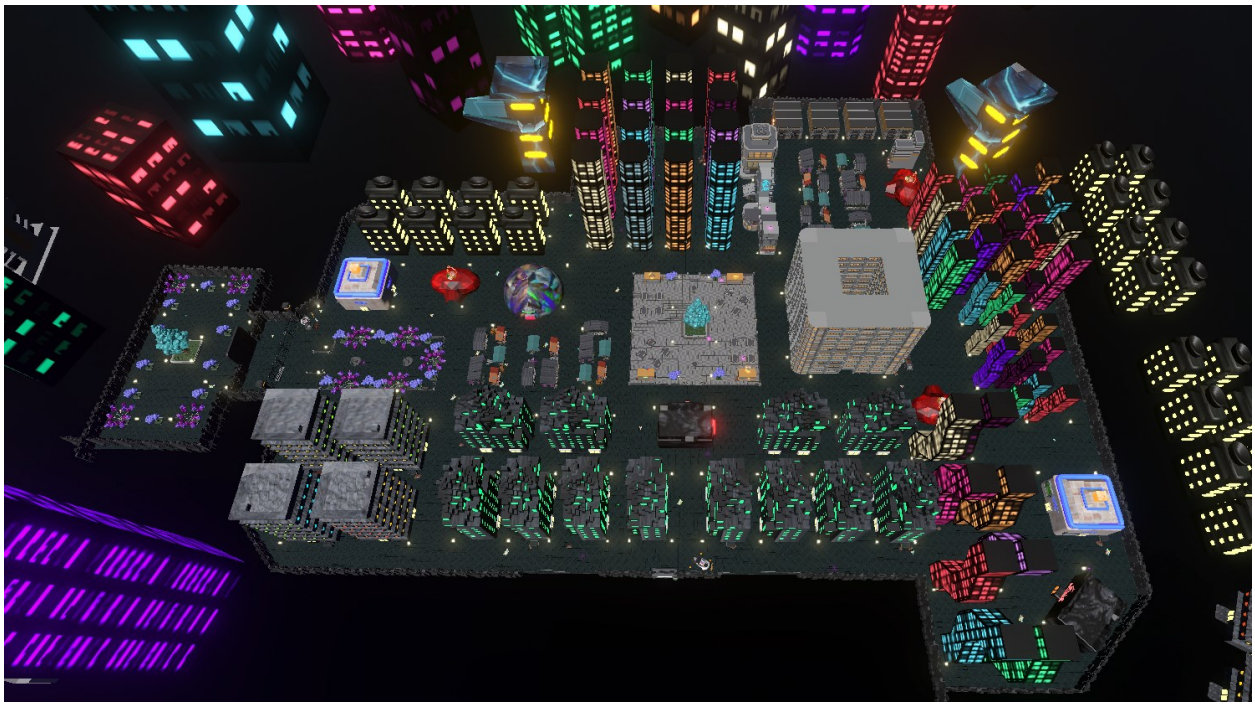


Image of the in-game 3D model

# 3. Level Design

System Overhaul is based on a Futuristic City. The city is divided into 3 parts, the spawn area where a brief introduction of the mechanics and story happens, and the zones where most of the gameplay occurs. Zone 3 is the hardest and it's locked until the player completes zone 1 and 2. Zone 1 and 2 will be available to explore from the start.

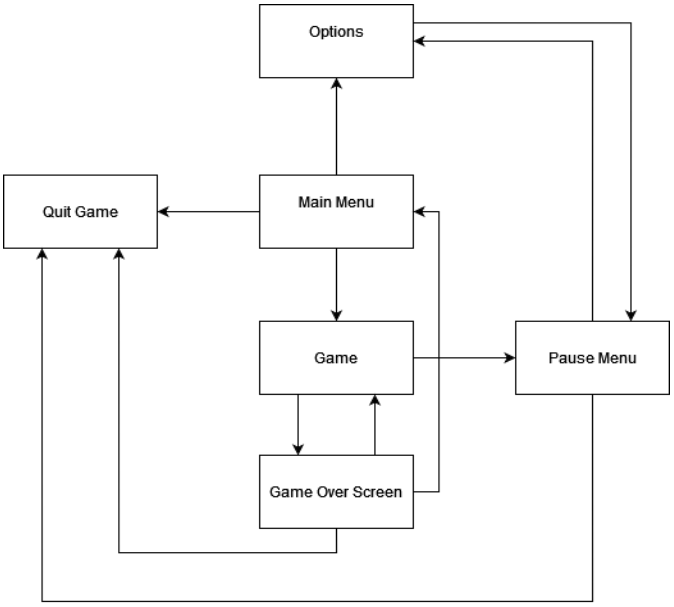
For the vertical slice, we will only have the spawn area and 1 zone.



We will be using lights around the world for example in neon lights, billboards and lamps, and shadows. Materials with emission to make them glow.

# 4. Menu Screens

## 4.1 Menu Flow



## 4.2 Main Menu


The main menu of the game consists of the “Play”, “Options”  and “Quit” buttons.

- **Play Button:** When clicked, the “Play” button will start the game.
- **Controls:** Clicking the Controls button will take you to the options menu where you see the keybindings.
- **Options Button:** Clicking the Options button will take you to the options menu where you can change the sound volume.
- **Quit Button:** The “Quit” button will quit/close the game.

## 4.3 Pause Menu

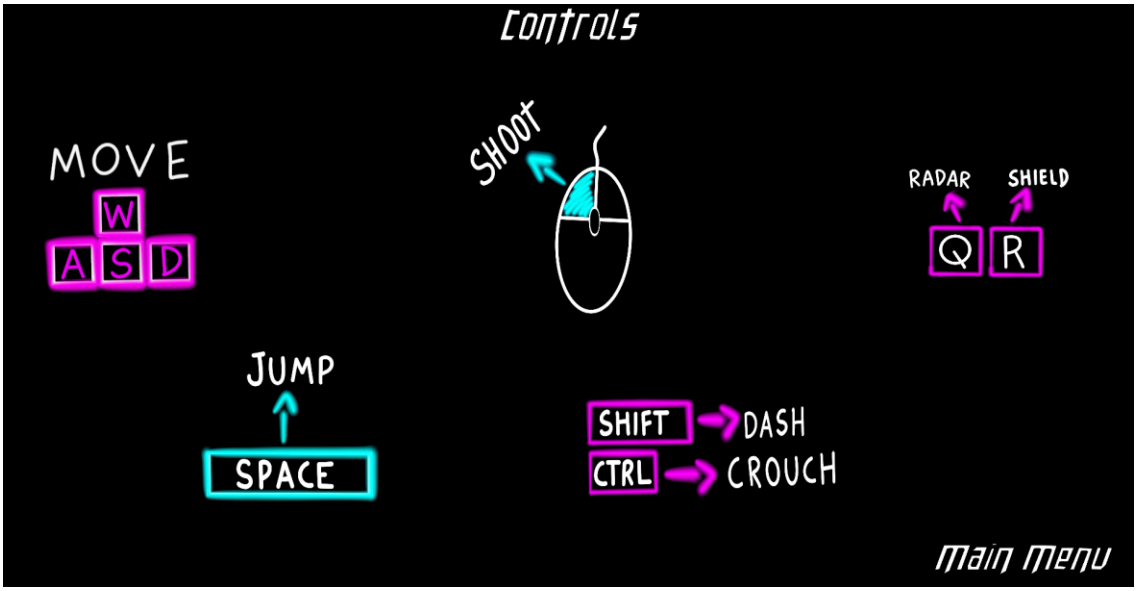

The pause menu is an in-game menu the player can use to pause the game and will show the following buttons:

- **Resume Button:** When clicked, the game unpauses.
- **Options Button:** Clicking the Options button will take you to the options menu where you can change the sound volume.
- **Controls Button:** Clicking this button showcases the key binds of the player's movement and abilities.
- **Menu Button:** When clicked it returns to the Main Menu.
- **Quit Button:** When clicked it exists in the game.

## 4.5 Options Menu


The Options menu shows the game music volume and the sound effects volume sliders which can be used to change the sound volumes.

## 4.6 Controls Screen




The Controls screen will show the controls to play the game.

## 4.7 Game Over Screen


The game over screen will appear when the player dies.

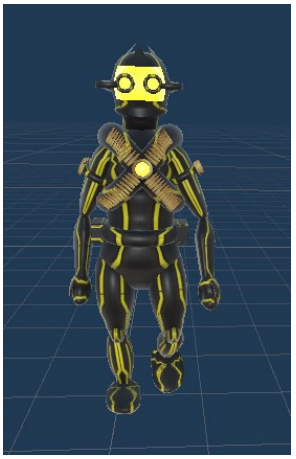
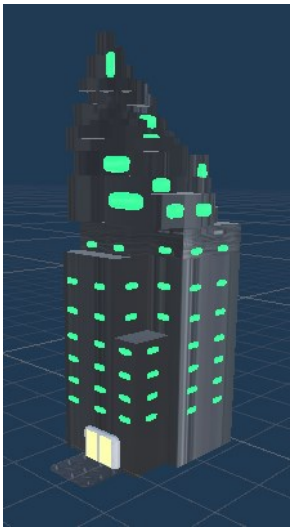
# 5. Art

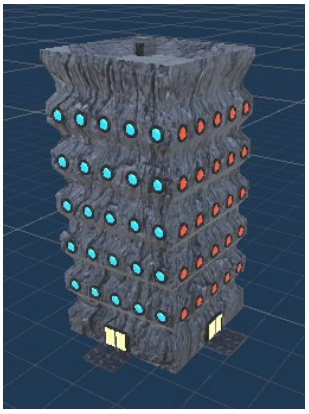
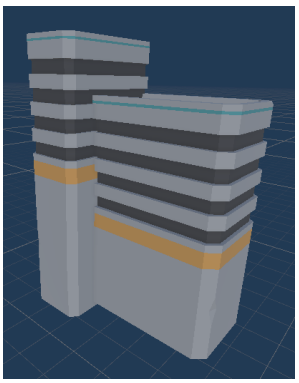
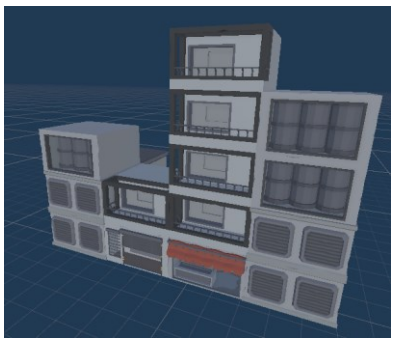
## 5.1. Style

System Overhaul has a low-poly sci-fi art style. The game takes place in a dystopian future, hence it has a cyberpunk style environment and characters. Neon lights are very common around the city environment.

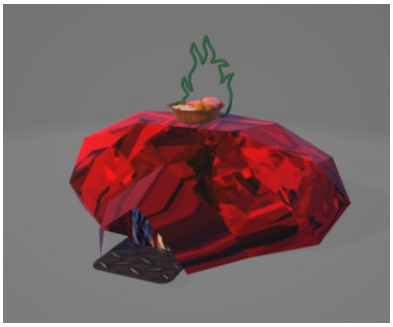
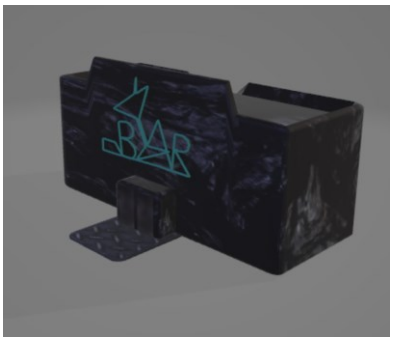
## 5.2. Assets List

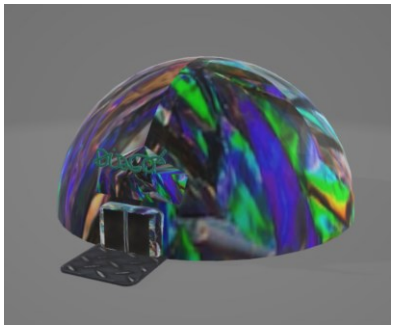
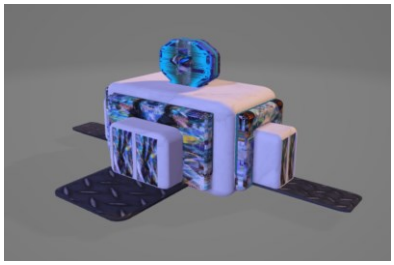
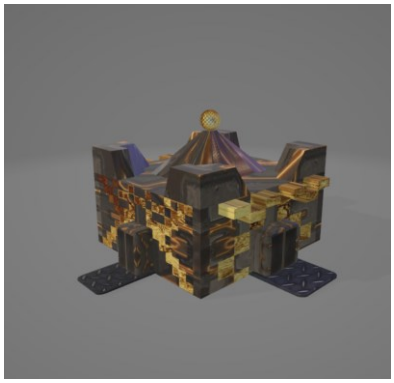
| Asset | Description | Reference |
|---|---|---|
| Main Character | 3D model of the main character |  |
| Melee Enemy | 3D model of the melee enemy |  |

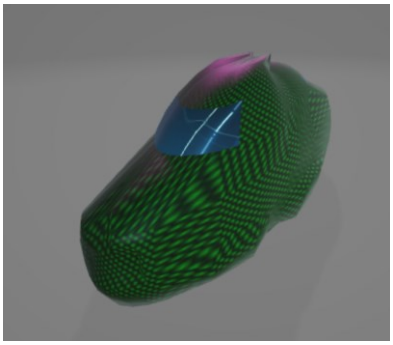
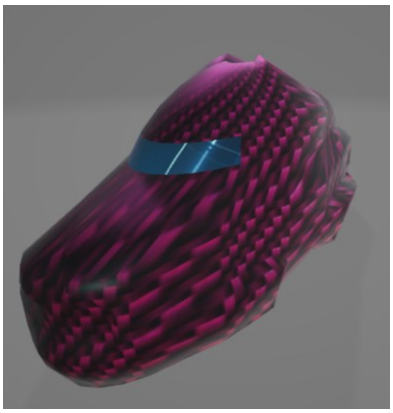
| | | |
|---|---|---|
| Ranged Enemy | 3D model of the ranged enemy |  |
| NPCs | 3D model for the NPCs |  |
| Building 1 | 3D model for building 1 |  |

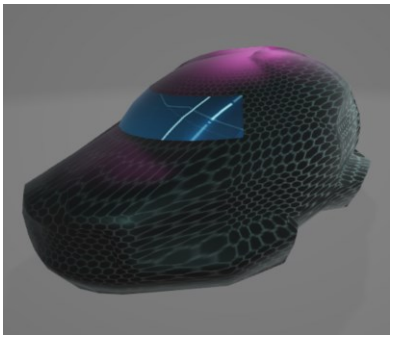
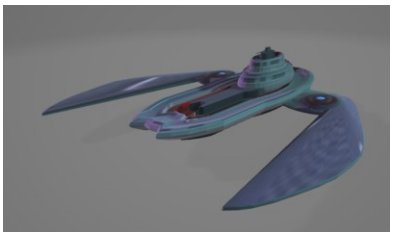
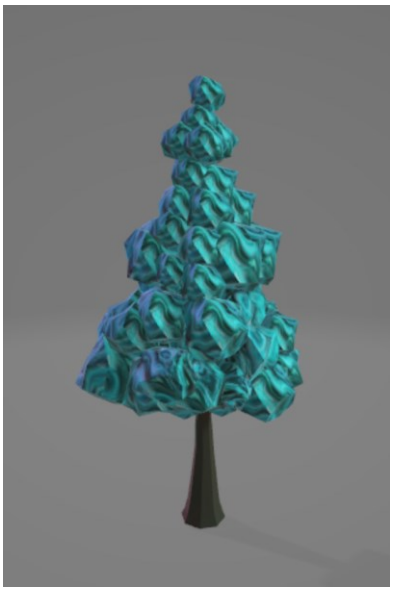
| | | |
|---|---|---|
| Building 2 | 3D model for building 2 |  |
| Building 3 | 3D model for building 3 |  |
| Building 4 | 3D model for building 4 |  |
| Building 5 | 3D model for building 5 |  |

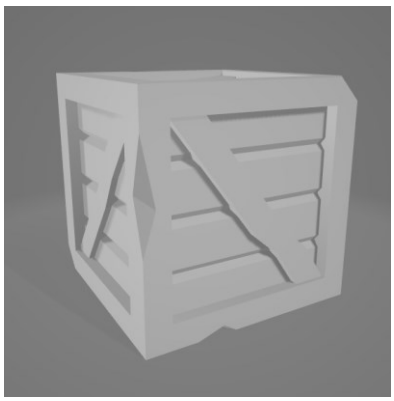
| | | |
|---|---|---|
| Building 6 | 3D model for building 6 |  |
| Building 7 | 3D model for building 7 |  |

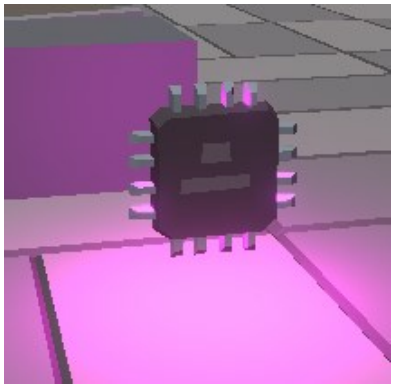
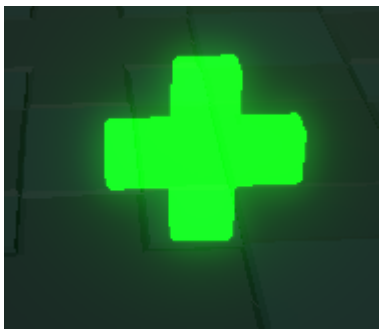
| | | |
|---|---|---|
| Building 8 | 3D model for building 8 |  |
| Restaurant | 3D model for the restaurant |  |
| Market | 3D model for the market |  |
| Bar | 3D model for the bar |  |

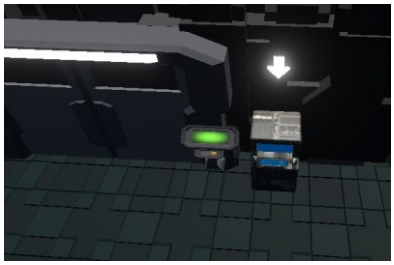
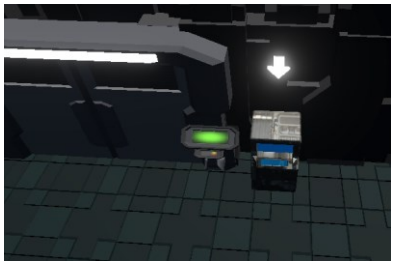
| | | |
|---|---|---|
| Disco | 3D model for the disco |  |
| Storage Unit | 3D model for the storage unit |  |
| Ship Tower | 3D model for the ship tower |  |
| Dictator Tower | 3D model for the dictator tower |  |

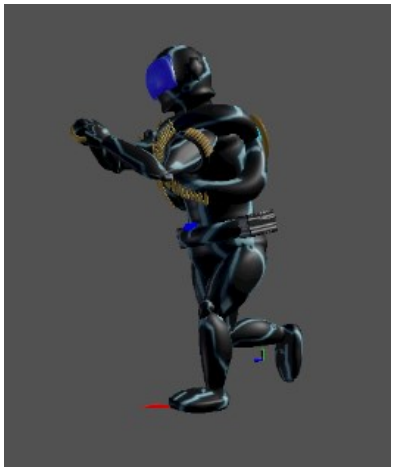
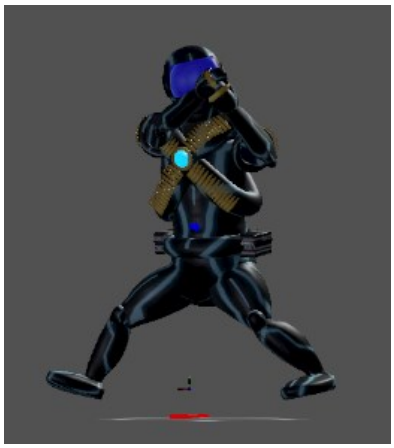
| | | |
|---|---|---|
| Tower | 3D model for the tower |  |
| Car 1 | 3D model for car 1 |  |
| Car 2 | 3D model for car 2 |  |
| Car 3 | 3D model for car 3 |  |

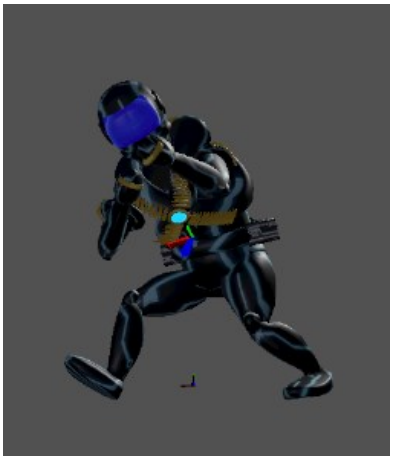
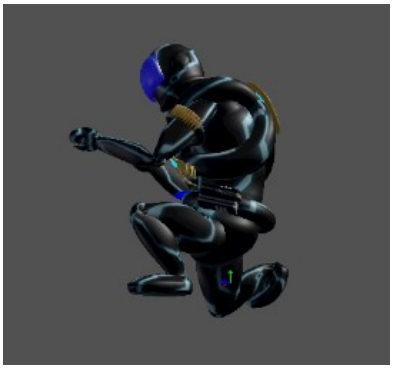
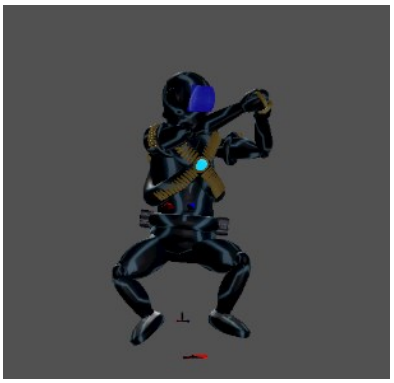
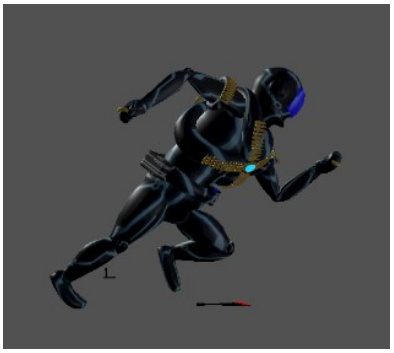
| | | |
|---|---|---|
| Car 4 | 3D model for car 4 |  |
| Car 5 | 3D model for car 5 |  |
| Bike 1 | 3D model for bike 1 |  |
| Plant 1 | 3D model for plant 1 |  |

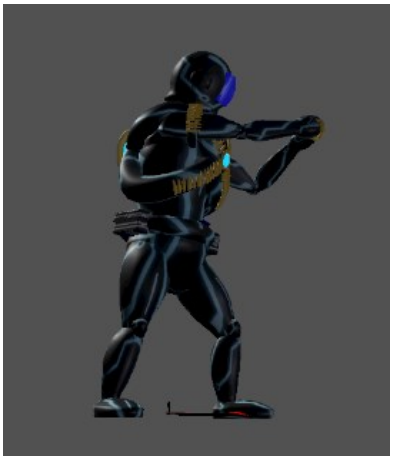
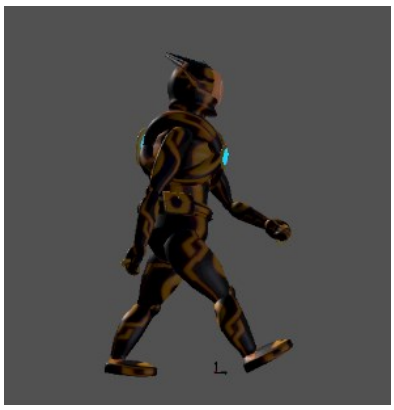
| | | |
|---|---|---|
| Plant 2 | 3D model for plant 2 |  |
| Plant 3 | 3D model for plant 3 |  |
| Box 1 | 3D model for box 1 |  |

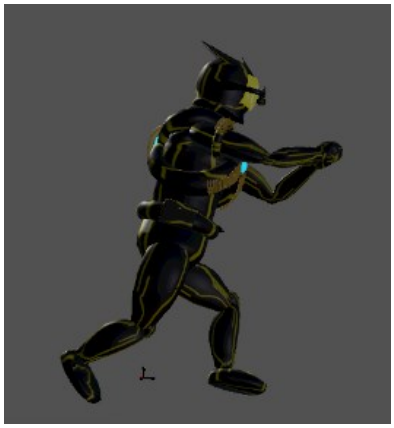
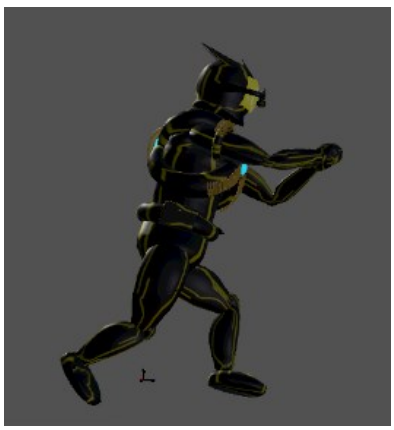
| | | |
|---|---|---|
| Upgrades Vending Machine | 3D model for the upgrades vending machine |  |
| Chips | 3D model for the chips |  |
| Green HP icon | 3D model for the green hp icon |  |
| HP Bar | 2D HP bar |  |

| | | |
|---|---|---|
| Lamps | 3D model for the lamps |  |
| Gate | 3D model for the gate |  |
| Puzzle Access Point | 3D model for the puzzle access point |  |

| Animation | Description | Reference |
|---|---|---|
| Running - Main Character | Running animation for the main character |  |
| Strafing - Main Character | Strafing animation for the main character |  |
| Crouch Walking - Main Character | Walking animation for when the player is crouched |  |

| | | |
|---|---|---|
| Crouch Strafing - Main Character | Strafing animation for when the player is crouched |  |
| Crouch Idle - Main Character | Idle animation that plays when the player is crouched |  |
| Jumping - Main Character | Jumping animation for the main character |  |
| Dashing - Main Character | Dash animation for the main character |  |

| | | |
|---|---|---|
| Idle - Main Character | Idle animation for the main character |  |
| Walking - Melee Enemy | Walking animation for the melee enemy |  |
| Attacking - Melee Enemy | Attacking animation for melee enemy for when he is attacking the player |  |

| | | |
|---|---|---|
| Walking - Ranged Enemy | Walking animation for the ranged enemy |  |
| Running - Ranged Enemy | Running animation for the ranged enemy when he's chasing the player |  |
| Attacking - Ranged Enemy | Attacking animation for the ranged enemy for when he is attacking the player |  |

| | | |
|---|---|---|
| Walking - NPCs | Walking animation for the NPCs |  |

# 6. Audio

## 6.1. Music Style

System OverHaul has a Futuristic/Sci-Fi music style that will play in the background.

One of the audio inspirations is

Risk of Rain 2 Soundtrack


## 6.2. Music Asset List

During the game there will be a few sound effects that are activated when an event happens.

| Description | Music Name |
|---|---|
| Music that keeps playing in the background. | “Background Music” |

## 6.3 Sound Effects

There will be multiple sound effects that play during the gameplay depending on the events that are taking place. Sound effects may reference other sci-fi music styles.

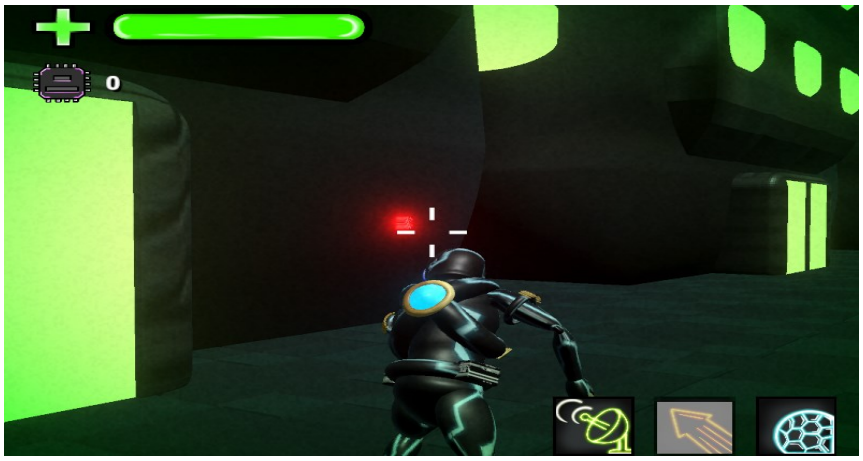
## 6.4 Sound Effects Asset List

| Event | Sound Effect |
|---|---|
| Melee Attack | Swinging sound effect |
| Ranged Attack | Gunshot sound effects |
| Player/enemy attacks hitting | Hit/taking damage sound effect |
| Running/walking | Footsteps sound effect |
| Taking Damage | Hurt sound effect |

# 7. Computer Graphics

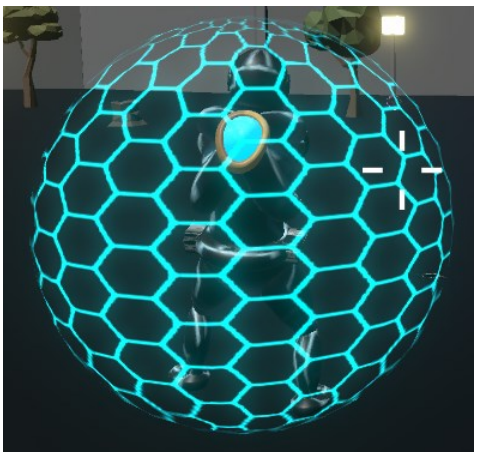
## 7.1. Radar Ability

We have a shader graph for when the player uses the radar ability. When in use the enemies will be outlined in red. For the third delivery, the enemies' chest gets highlighted in red. A post-processing effect is also activated, making the screen's edges green and adding some grain.



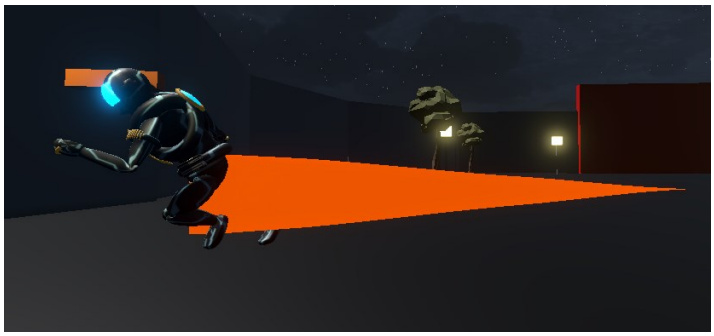
## 7.2. Shield Ability Shader

A manually implemented shader was used for the shield Barrier. This shader uses a transparent texture and has emissions to stand out. The alpha of the color of the shield also decreases over time to tell the player that their ability is about to end and enter its cooldown.



## 7.3. Dash Trail

When the player dashes, a trail renderer component, that is attached to the player, is set to active for the duration of the dash and then disabled when the duration of the dash is over.

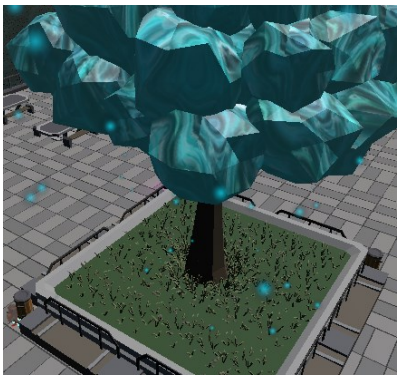


## 7.4. Health

If the player gets hurt, a post-processing effect will be triggered that makes the edges of the screen red. The lower the health of the player, the darker the red color becomes. Once the player starts to regenerate the red color will decrease its intensity.


## 7.5. Checkpoint Particle Effect

We added particles to the checkpoints so that they could be more visible and once the player collides with the checkpoint the particles are destroyed.



## 7.6. HP Pick-ups

Around the city, there are these green health pick-ups that, use a shader to make them move up and down, and they are also transparent and have emissions to be clear to the player that they can grab them.

## 7.7. Bullets

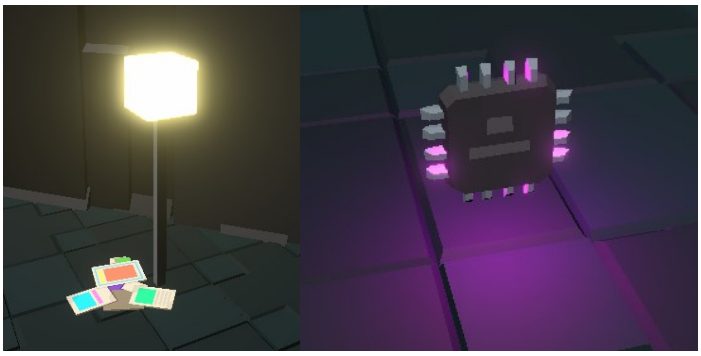
The prefab of the bullet has a trail renderer component very similar to the one for the dash. It is always set to active so it's visible as soon as a bullet is fired. When the bullets collide with an object some spark particles are instantiated at the point of impact and a bullet hole is also instantiated at the same point.

The ranged enemies' bullets are similar to the player’s bullets but with a blue-colored bullet trail. The enemy bullets also have a point light to give them a glow effect but don’t emit shadows.

## 7.8. Lights

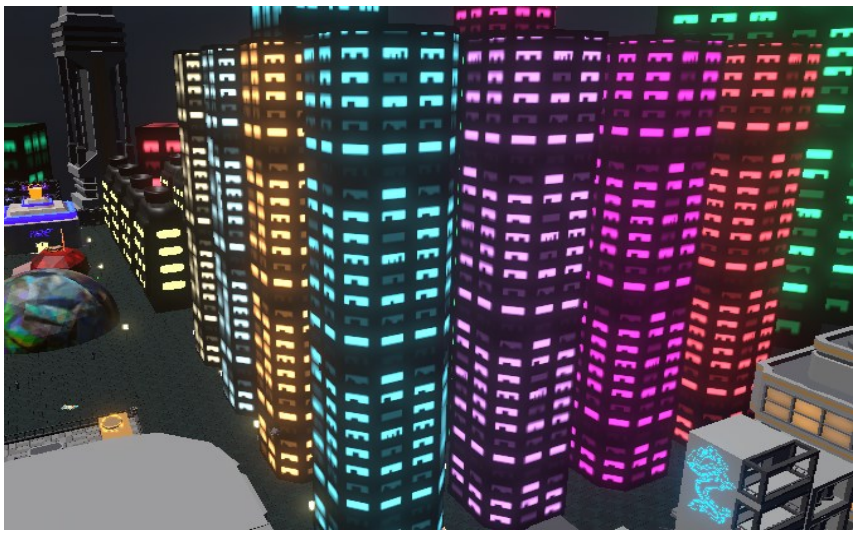
We are using lights, around the world, for our neon lights, lamps, and chips. Materials with emission make the neon lights glow.

For the lamps, we used point lights. We also used point lights for the computer chips giving them more visibility. The light on the chips doesn't emit shadows, and the one on the lamps emits soft shadows.



## 7.9. Buildings

Most buildings in our city have emissions to make them more appealing and have a neon effect.

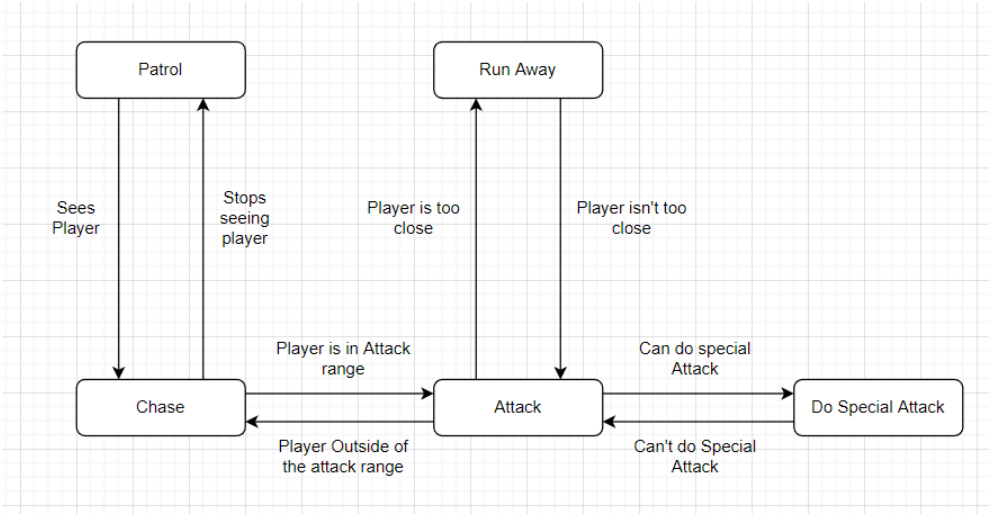


## 7.10. Rain Particle Effect

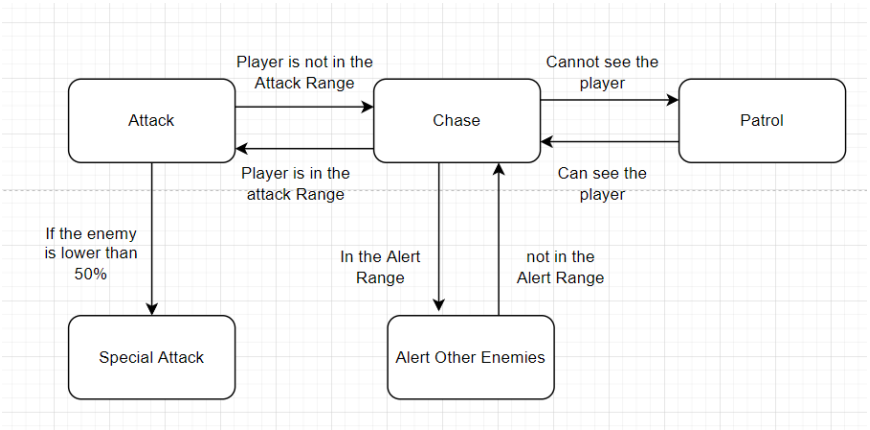
On the main menu, there is rain to make the menu more dynamic and interesting.

# 8. Artificial Intelligence

## 8.0.1 Ranged Enemy State Machine

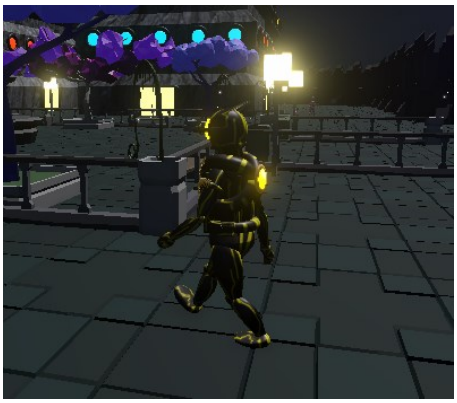



## 8.0.2 Melee Enemy State Machine



## 8.1. Patrol

Both the melee and the ranged enemies have waypoints scattered all over the map that they follow when they are in the patrol state when they haven't detected the player.



## 8.2. Chase

In the chase state the enemies will run after the player and chase him down after they have detected him.

## 8.3. Attack

In the attack state the enemies attack the player when they are in the optimal range to do so. The ranged enemy shoots bullets and the melee enemy punches the player.

## 8.4. Run Away

The runaway method is used when the player gets too close to a ranged enemy and the enemy will try to keep his distance between himself and the player by backing off.

## 8.5. Melee Enemy Special Attack

When the enemy´s hp is lower than 50% he stops doing his normal attack and switches to the special attack, which does 3 times more damage.

## 8.6. Alert Nearby Enemies

The enemies can alert others in a certain radius around them; any other enemies in that radius will be alerted and immediately rush to the player.

## 8.7. Ranged Enemy Special Attack

The ranged enemy special attack makes the ranged enemy release a bigger energy bullet, from time to time, that will cause more damage to the player.

## 8.8. Look At Behavior

The enemies will look at the target when patrolling the target will be the next waypoint and when they are chasing and attacking the target will be the player.

## 8.9. Friendly NPCs

The friendly NPCs will be walking around the area, and if the player gets close to them the friendly NPCs will say a random phrase, other than that the player won't be able to interact with them.

For the AI of the friendly NPCs, we used steering behaviors. We used wandering, looking in the direction so that they would always look to where they are moving, collision avoidance, and obstacle avoidance so that they can detect obstacles such as walls and buildings and avoid colliding with them.

### 8.9.1 Wander Behavior

The friendly NPCs have the wandering behavior which makes them wander around the city at random without the need for waypoints.

### 8.9.2 Look At Direction Behavior

The Look At Direction Behavior makes it so that the enemies and NPCs both always rotate and face the direction in which they are moving.

### 8.9.3 Obstacle Avoidance Behavior

Obstacle Avoidance Behavior makes the NPCs able to avoid walking into obstacles like walls, buildings, fences, etc by doing raycasts a short distance in front of them, if the rays hit an obstacle the NPCs immediately change direction.

### 8.9.4 Collision Avoidance Behavior

The Collision Avoidance Behavior allows NPCs to avoid collisions with each other based on their current velocities.