Describes the design of the CSE 5912 project by redbyte named Quantum.

Quantum

Game Design Document

Isaac Folzenlogen
Tyler Wolf Leonhardt
Derek Murphy
Joey Radebaugh
Phillip Wilberforce Stone
Alex Stopar

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Contents

1 Game Overview

The game is called *Quantum*. It is a puzzle platformer in the style of *Portal*. The goal of the game is to reach the exit of each level.

2 Background Information

The player controls the Astronaut on his way out of a black hole. While initial progress is made by walking and jumping, the Astronaut quickly discovers that some destinations cannot be reached by the laws of physics he is familiar with. As he continues his quest, he eventually encounters warp entities that he had to take advantage of to make his escape. The Astronaut can translate, rotate or scale these entities to gain access to previously inaccessible areas.

3 Storyline

At the beginning of the game, the Astronaut is investigating a distress signal from a research team that has strayed dangerously close to a black hole. The captain takes his ship to help the research team. Danger strikes; he is caught in the gravity of the black hole. Despite the best efforts of his crew, the ship begins to pass beyond the event horizon, trapped in the void's immense gravitational pull. As this happens, a dark, malevolent force from within the black hole roars and the ship is pulled in as the captain loses consciousness.

Upon waking up, the Astronaut finds himself in a strange, ethereal environment. He has fallen a great distance through the black hole. Walking forward, he eventually crosses a bridge that appears to be made of pure light, entering an eerie, alien structure on the far side. Within the structure, paths lead off in different directions, but at the center rests another, small black hole, as if this whole structure were a shrine to it. During this journey, the Astronaut realizes he has gained abilities which grant him

control over the physical bodies around him. He is able to warp objects within the strange environment at will.

Exploring the huge structure, the Astronaut makes his way through peril after peril: deadly falls, inhuman sentries which mercilessly kill interlopers, and ethereal structures, all seemingly created by some unseen creature or force. At the end of each path, the Astronaut finds himself back where he has come from, the black hole growing in size each time, until it eventually something snaps; the black hole's expansion continues unchecked, and the Astronaut finds a mysterious path which was once inaccessible to be the only exit. Battling past alien dangers, he finds his ship, boards, and escapes the black hole.

4 Gameplay

4.1 Control

An X-Input compatible controller is used for input. Actions and their button mappings are listed below.

4.1.1 Movement

Requires: Left-Control-Stick

In the style of *Super Mario* 64, movement is fairly simple. The player is controlled with the left-control-stick. Tilting the control stick in a direction moves the player along the X-Y plane in that direction. If the player is adjacent to a wall the player cannot move through the wall. If the player is adjacent to an inclined plane the player ascends or descends the inclined plane depending on the slope of the plane in the direction the control stick is being pressed. The maximum slope of a plane which can be ascended will be determined by play testing.

Warp takes place from a third-person perspective with the camera following the player at a fixed rotation, controlled by vector fields which will be described later, rather than by player input. If the

player walks behind an object that obscures their view from the camera the object fades until it is transparent.

4.1.2 Jumping and Falling

Requires: A-Button

Pressing the A-Button causes the player to jump a short distance. Upon pressing the A-Button the player receives an upwards impulse. While in the air, the player's vertical velocity is affected by gravity. The vertical velocity decreases by a constant amount every second. The exact amount will be determined by play testing.

4.1.3 Targeting

Requires: Left-Trigger, Right-Control-Stick

Some entities within the game may be targeted. To target these entities, the player presses the Left-Trigger. A vector will be drawn forwards through the center of the screen and the closest targetable object to the vector is selected. When the left trigger is used to target an object, the entity changes color, to illustrate this to the player. To change targets, the player may point the Right-Control-Stick towards the direction of the desired object in screen space while holding the Left-Trigger.

4.1.4   Activating Targets

Requires: Right-Trigger

Pressing the Right-Trigger causes an entity to be activated if it is targeted. All targetable entities can be activated.

4.2   Winning Conditions

The winning condition for each level of Warp is simply to get to the end of the level by platforming and solving puzzles. If the player achieves this goal they have won the level. The exit point of each level is represented by a wormhole which has a picture of the main hub projected onto it. The exception to this is the final level, which is finished when the player reaches the spaceship.

4.3 Death

The player dies if they collide with certain entities in the environment or if they fall off the map. If the player dies, they respawn at the last checkpoint they have reached in a given room, and objects which had previously been targeted are deselected and reset to their original position.

4.4 Camera Movement

The camera sits on a track and advances as the player travels through rooms. The track controls the camera's position and rotation at all times. The camera cannot move from this fixed track. The track will cause the camera to rotate so that it faces important information in each scene. When the game is displayed on an Oculus Rift, the camera will also rotate via head motion, which, in turn, will allow the player to target objects being directly looked at by the player more easily.

5   Entities

5.1   Player

The player is an astronaut in a spacesuit who can jump, walk and manipulate the environment with the targeting system in order to proceed through the game. The player dies if they fall of the edge of the map or if they encounter certain environmental dangers.

5.1.1   Secret Sharkhead Player

An Easter Egg included within Quantum, a trigger is hidden within the Wallblock Level, which, when activated by the player, removes the helmet of the Astronaut's spacesuit, revealing the head of a hammerhead shark.

5.2 Targetable Entities
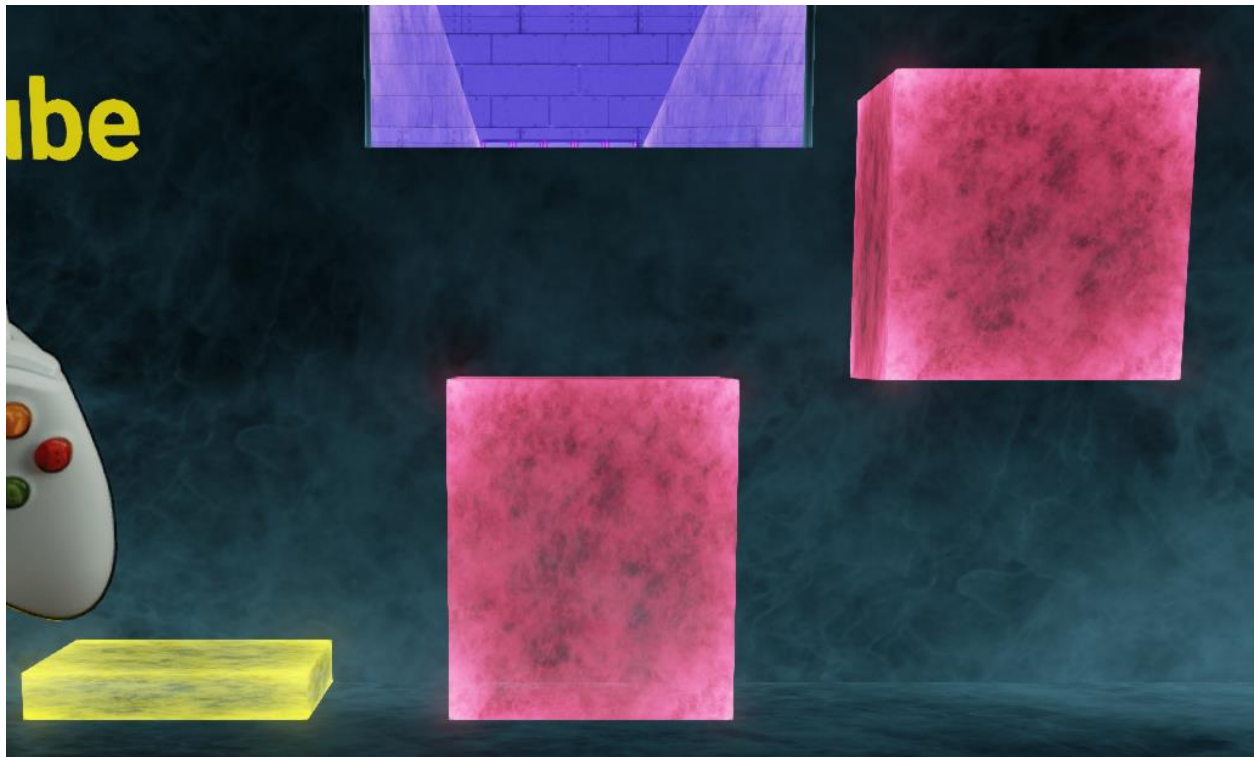
All of the targetable entities in Warp are transparent cubes which emit light. They fade between Accent 1 and Accent 2. Activating a targetable entity causes it to translate, rotate or scale. To determine how the targetable entity moves, the player must rely on experimentation. In order to facilitate this sort of puzzle design, which emphasizes a lack of hand-holding by nature, all movements can easily be reversed. After an entity is targeted it is highlighted so that it is clearly visible to the player. Targetable entities block each other's paths as well as the paths of other objects in the scene. There are three divisions of targetable entities.

5.2.1 Single Press Entities

Single Press Entities are colored with Accent 1. When activated, they move along a fixed path until they collide with another object or reach their destination. When the Single Press Entity collides or reaches its destination, it stops. After this, they can be activated again to move towards their original position.

5.2.2 Hold and Return Entities

Hold and Return Entities are colored with Accent 1 until they are activated. As the activate button is held they fade to Accent 2 and move along a fixed path until they collide with another object or reach their destination. When the Hold and Return Entity collides or reaches its destination, it stops. After the activate button is released they move towards their original position and fade back to Accent 1. Though present in prototype levels, this type of object did not reach the final product, due to playtesting results.

5.2.3 Continuous Entities

Continuous Entities are colored with Accent 1. When activated, they move along a fixed path until they collide with another object or reach their destination. When the Continuous Entity collides or reaches its destination it stops, and immediately returns to its original position and can be activated again.

5.3 Environmental Dangers

Environmental dangers cause the player to die immediately when the player collides with them.
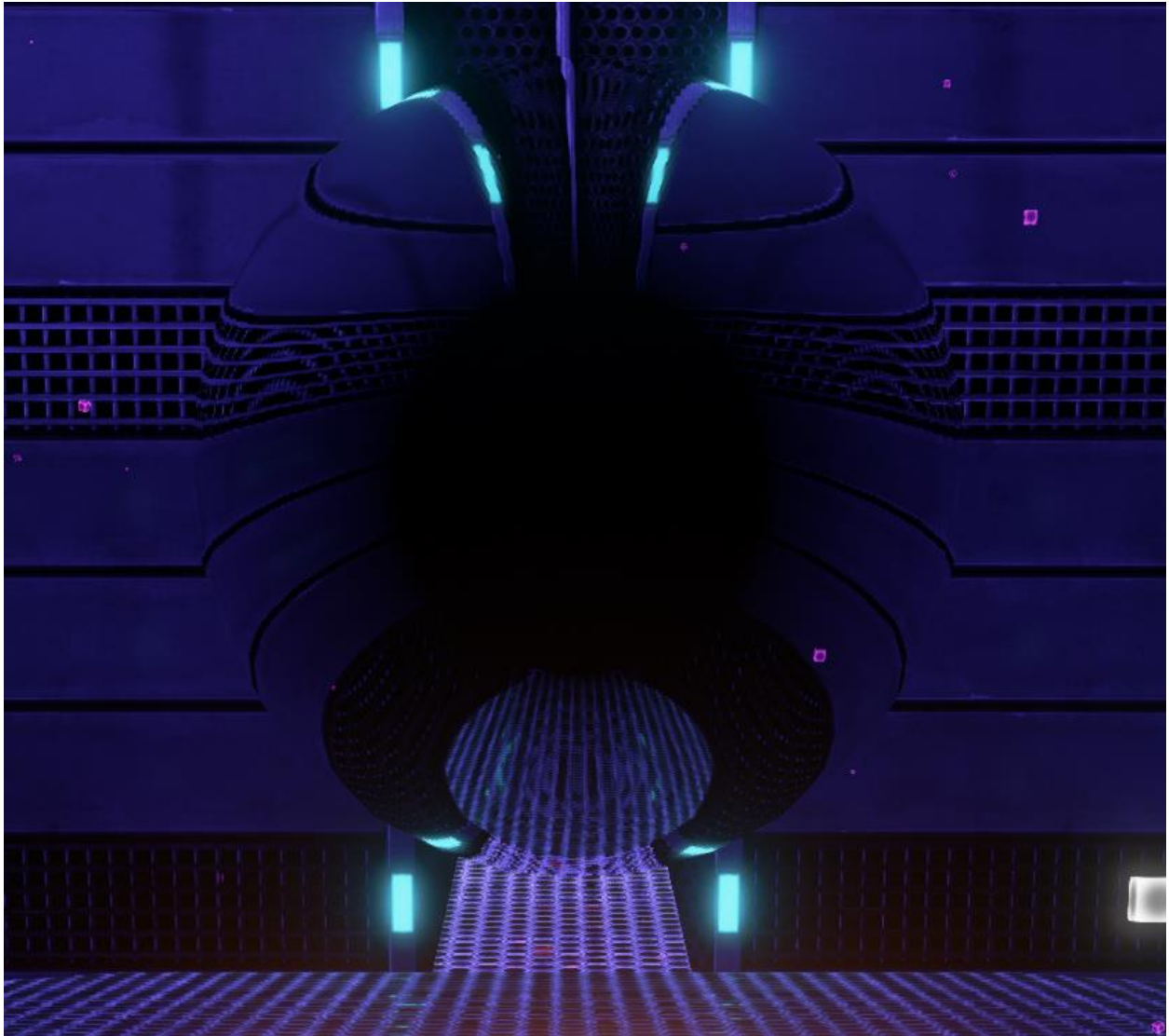
5.3.1 Gravity Well

The gravity well appears as a miniature black hole. The black hole warps the appearance of the geometry of the objects around it, and applies a gravitational pull to the unsuspecting player who wanders too near to it.

5.3.2 Emit Turret

The emit turret appears as a bizarre, mechanical being with a small, floating cube behind it.

When the player wanders into an emit turret's sphere of influence, it tracks the player with a speed that

is specified for each turret. After it has lined up with the player, the turret fires, and the small cube

expands outwards, creating a field of energy which kills the player, if they are not able to avoid it.

5.3.3   Bacillus
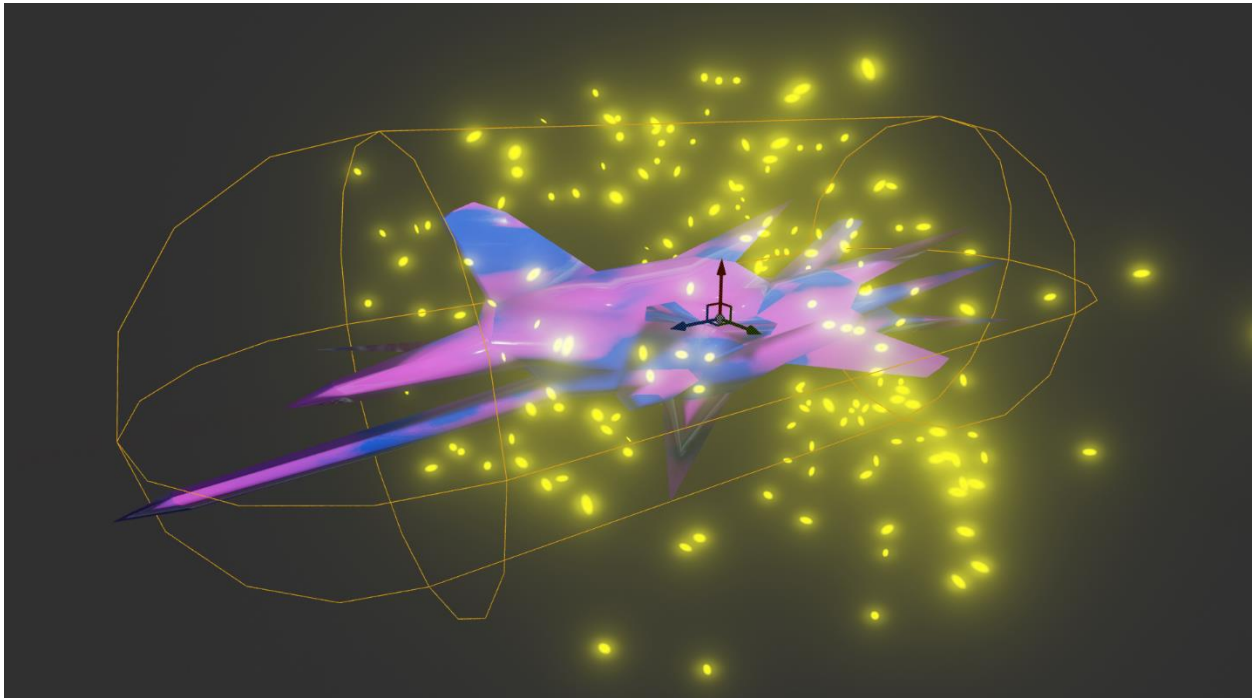
The bacillus is a stationary object with the appearance of a sort of alien bacterium. Floating

around it is a particle effect, having the appearance of hundreds of tiny, glowing, yellow bacteria. If the

player comes into contact with this object, they die.

5.3.4   Quantum Spheres

Quantum spheres are colored spheres which alter the physical structure of the character, or the

way in which the player interacts with the physics of the world, upon stepping into them. There are four

types of Quantum sphere.

5.3.4.1   Null-G Sphere

Stepping into the Null-G sphere turns off gravity for the player. While within the bounds of the

sphere, the player can move around freely, without gravity. This can be used to propel the Astronaut to

new heights.
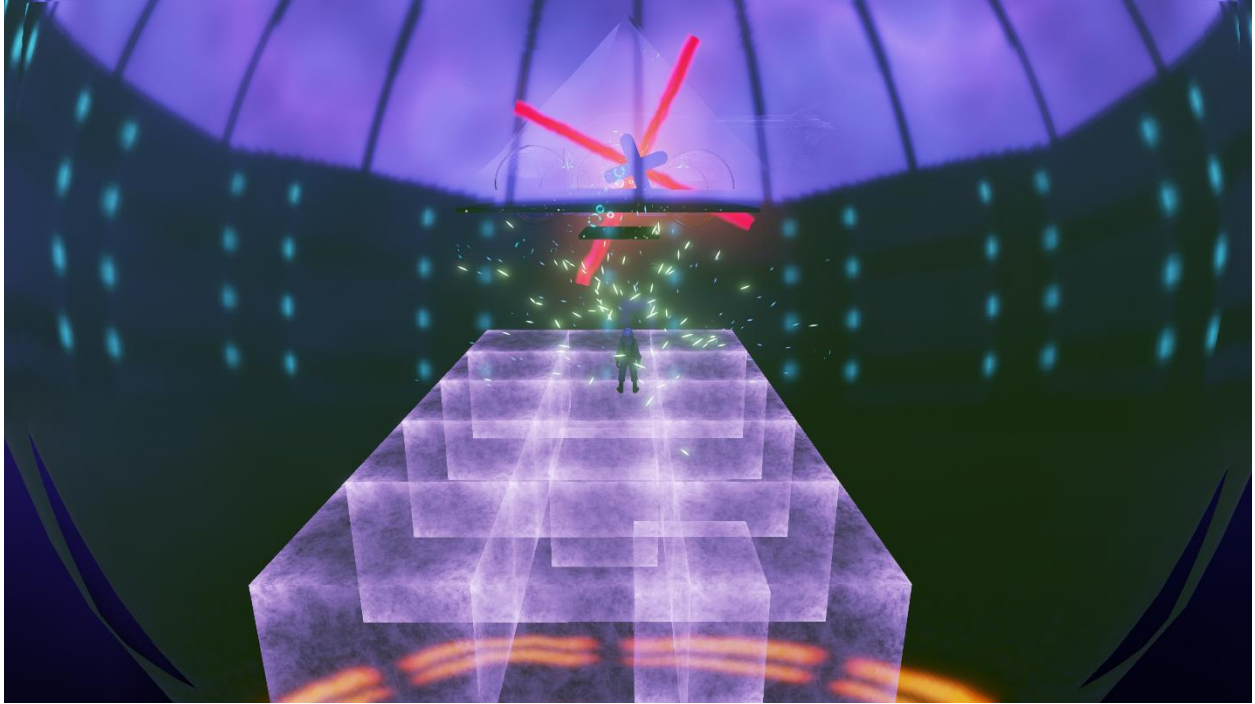
5.3.4.2   Shrink Sphere

Stepping into the Shrink sphere makes the player smaller. The further the player walks into the sphere, the smaller they become. This can be used to help the Astronaut walk through doorways fit for a mouse.

5.3.4.3   Squash Sphere

Stepping into the Squash sphere compresses the player, making them shorter. The further the player walks into the sphere, the shorter they become. This can be used to help the Astronaut walk underneath obstacles low to the ground.

5.3.4.4 Squeeze Sphere

Stepping into the Squeeze sphere makes the player both taller and thinner. The further the player walks into the sphere, the taller and thinner they become. This can be used to help the Astronaut walk through cracks and crevices too thin to do so otherwise.

5.3.5   "Pushy Penguins"
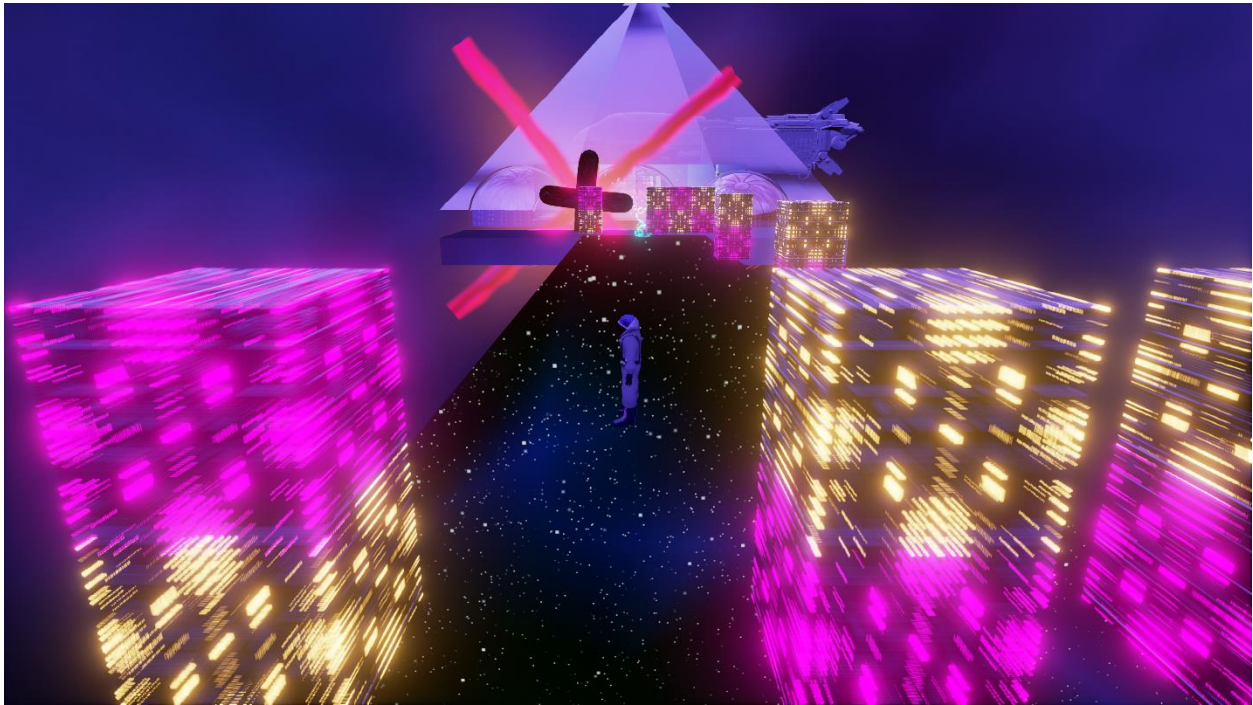
Modeled after a Mario Party mini-game, the Pushy Penguins are objects which appear as the player moves along a bridge in the ending sequence. They appear in lines, and move steadily towards the other end of the bridge they spawn on, pushing the player, should they be unable to navigate between the holes in each line.

5.4   Scenery

The scenery of Warp falls into two main categories: realistic and surreal. The realistic scenery is composed of space phenomena and natural space debris. Space phenomena includes objects like black holes and natural space debris includes objects like asteroids or dust. Surreal scenery includes objects composed of light and alien-like structures and creatures. Surreal scenery can be composed of cubes, or custom-made meshes.
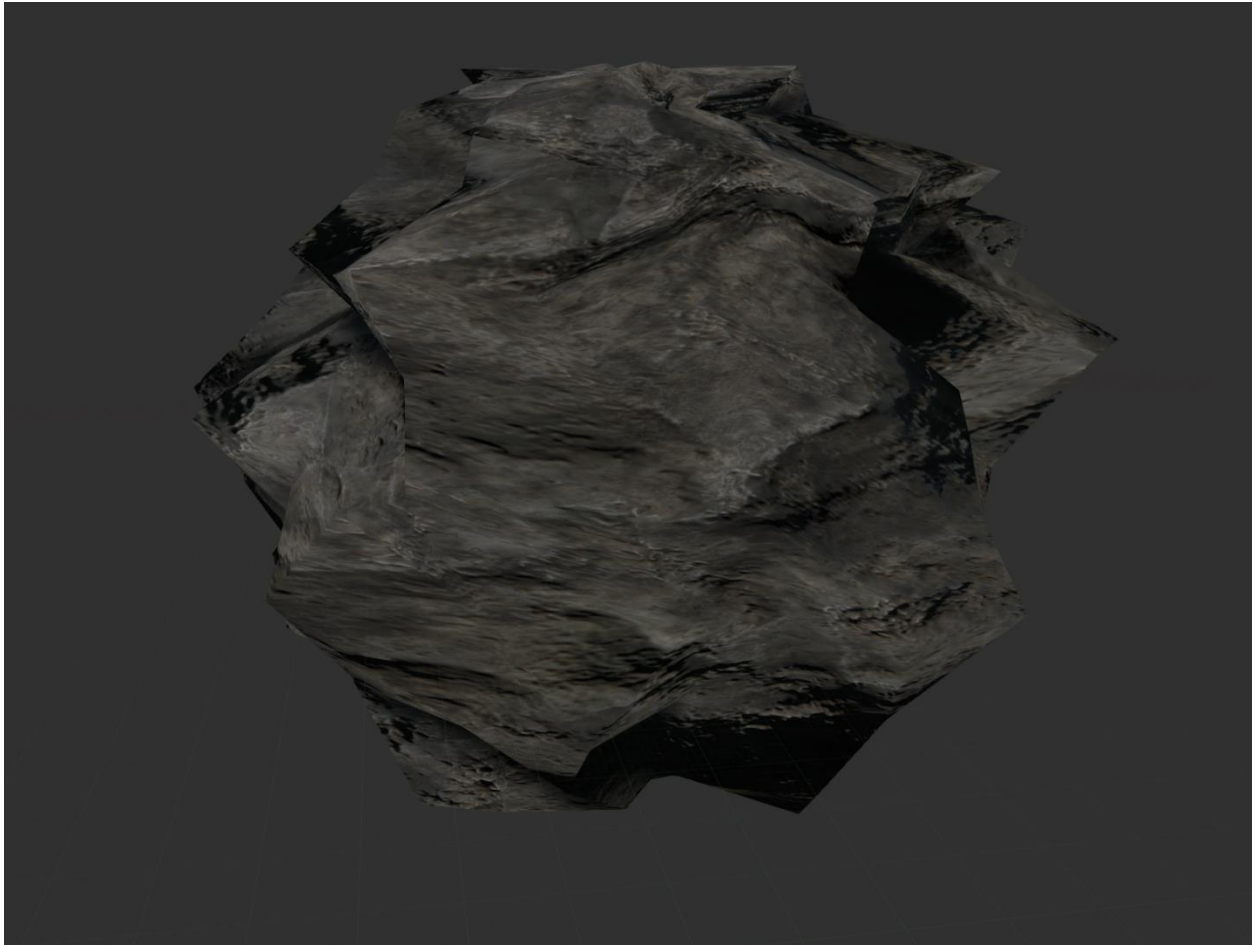
5.4.1   Asteroid

The asteroid is a spherical rock typical of a real-world asteroid. These entities are found floating

in space towards the gravitational pull of the black hole in the title menu.

5.4.2   Alien Structure
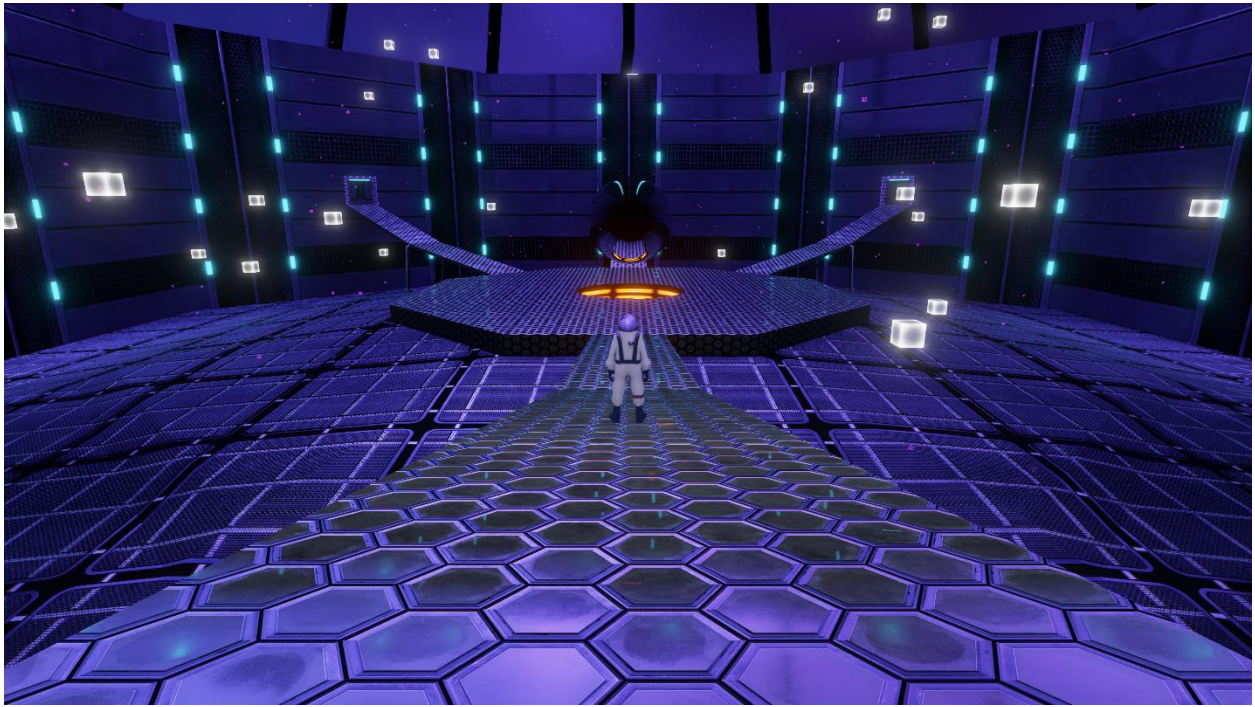
This entity serves as the main hub for the player, and is designed as a huge, open structure

through which the player can move on their way to other levels. Emissive and reflective textures cause

this scenery to give off unnatural light.
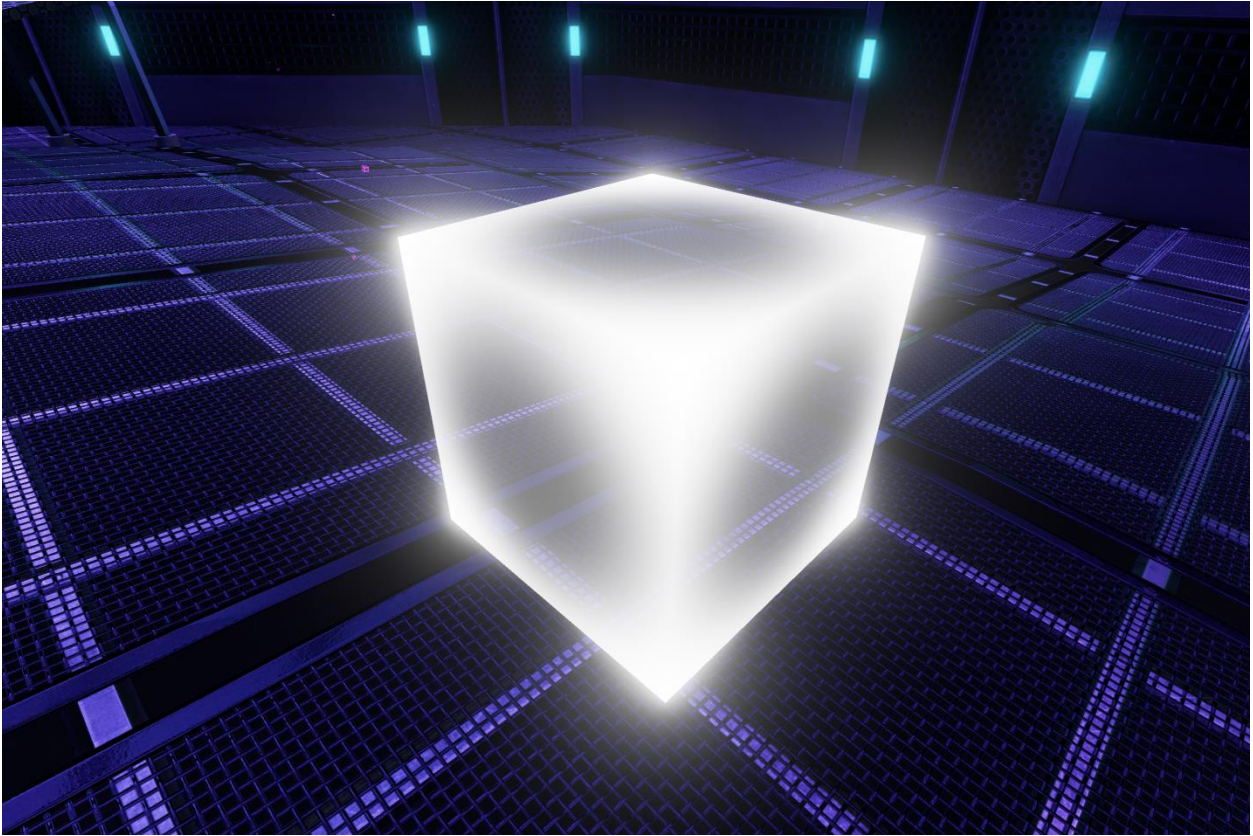
5.4.3 Cube Lights

Cube lights are large, floating cubes which emit white light for the player. Some appear as stationary in the scene, and others slowly float back and forth along a set path.

5.4.4　　　　Cube Light Particle Effect
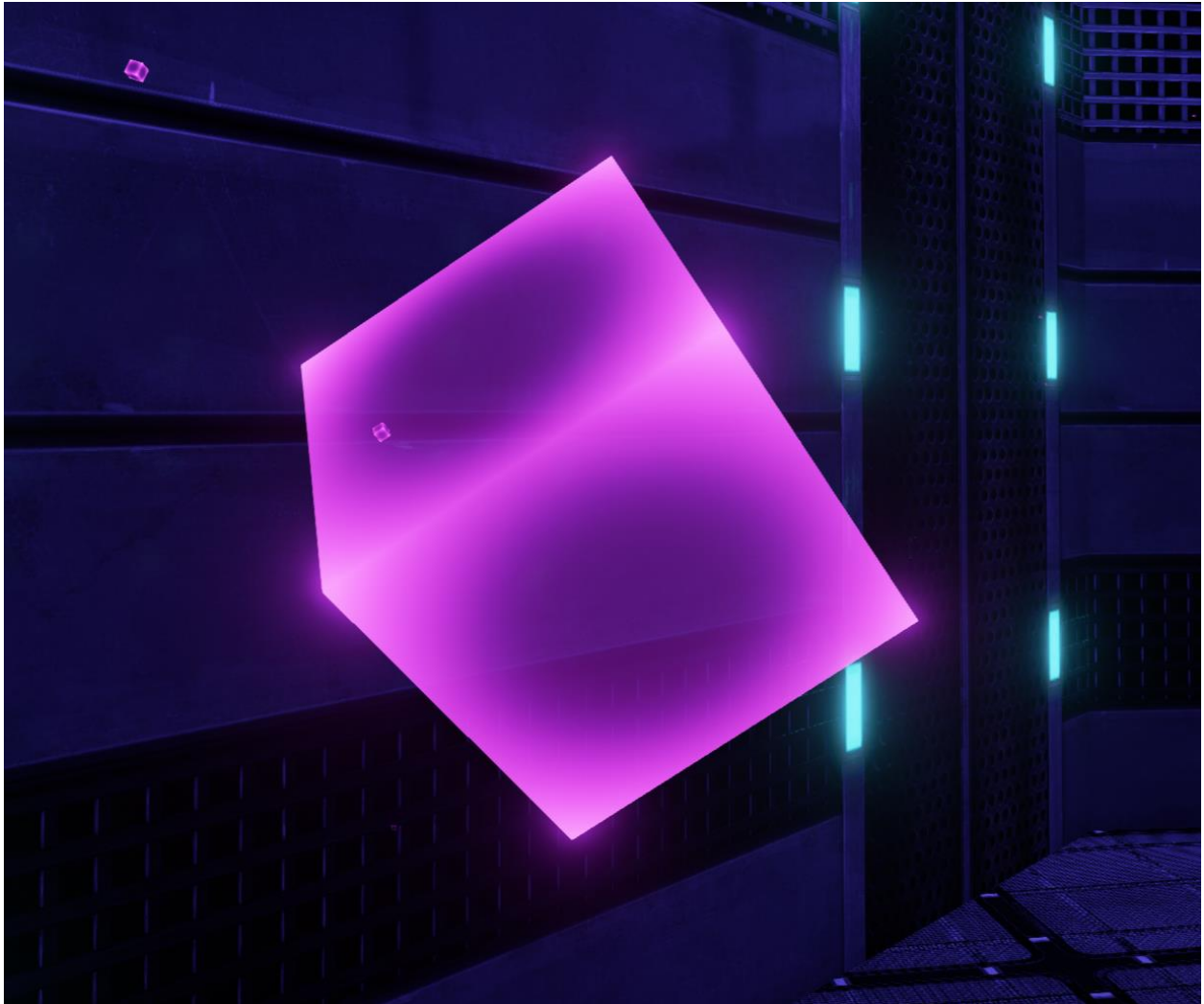
A particle effect of smaller, red cube lights also floats through areas in the game. These float about the region in which they spawn freely, and provide ambient lighting and atmosphere for the player.

5.4.5   Spaceship

The spaceship serves as the final piece of scenery in the game. Once the player reaches it, the game ends.

5.5   Other Gameplay Entities

5.5.1   Level Exit
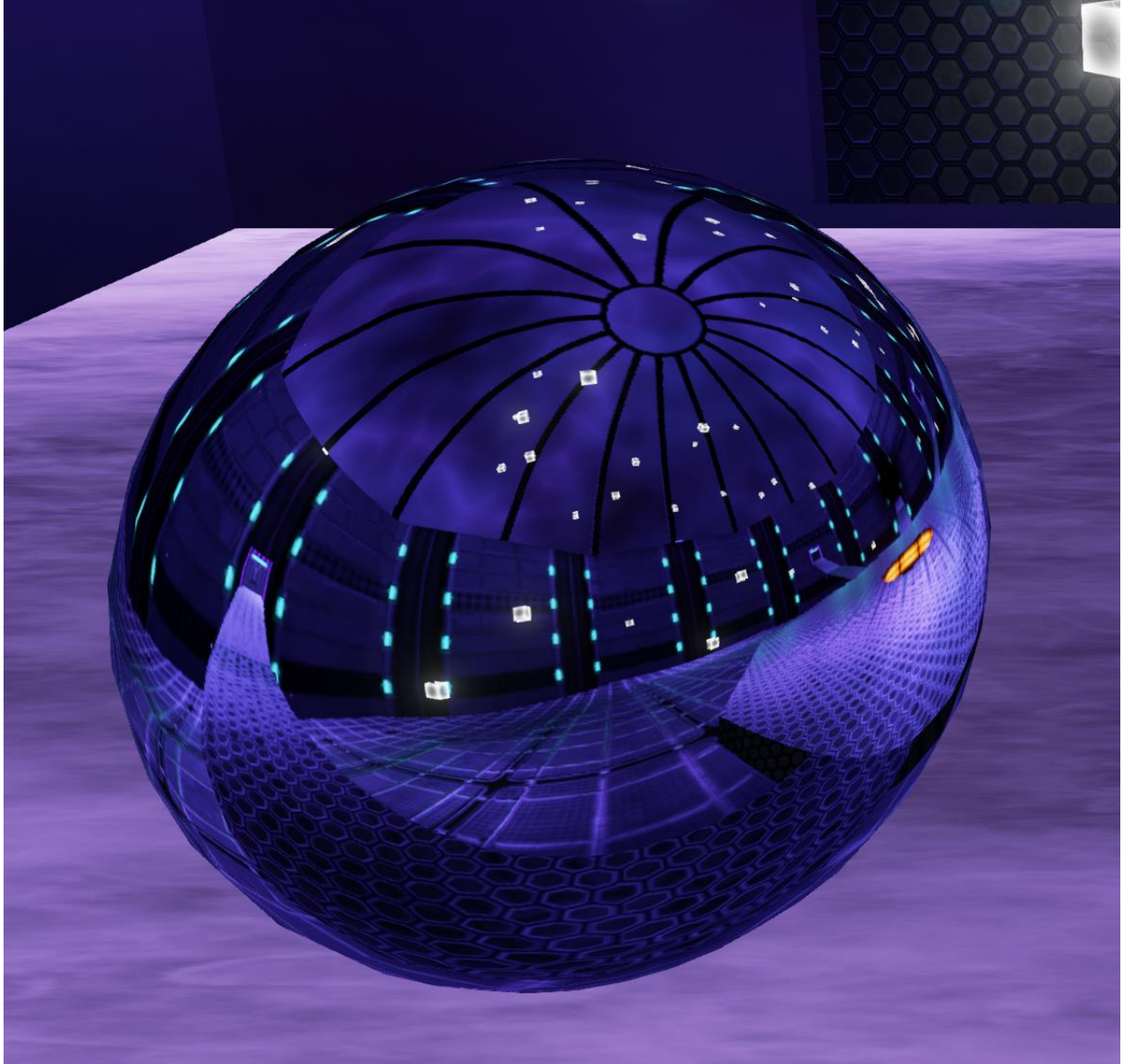
This entity is a wormhole leading to the next level. When the player looks into the wormhole they can see parts of the hub level. Getting within a certain distance of the wormhole will begin a matinee where the player enters the wormhole.

5.5.2   Light Bridge

The light bridge is a collection of emissive cubes along a continuous line. The cubes in a given light bridge object each expand outward from a single location, and each cube expands outwards as the player character approaches the location of its destination. After the player has walked across them and begins to move away, the cubes retract back into their original location.
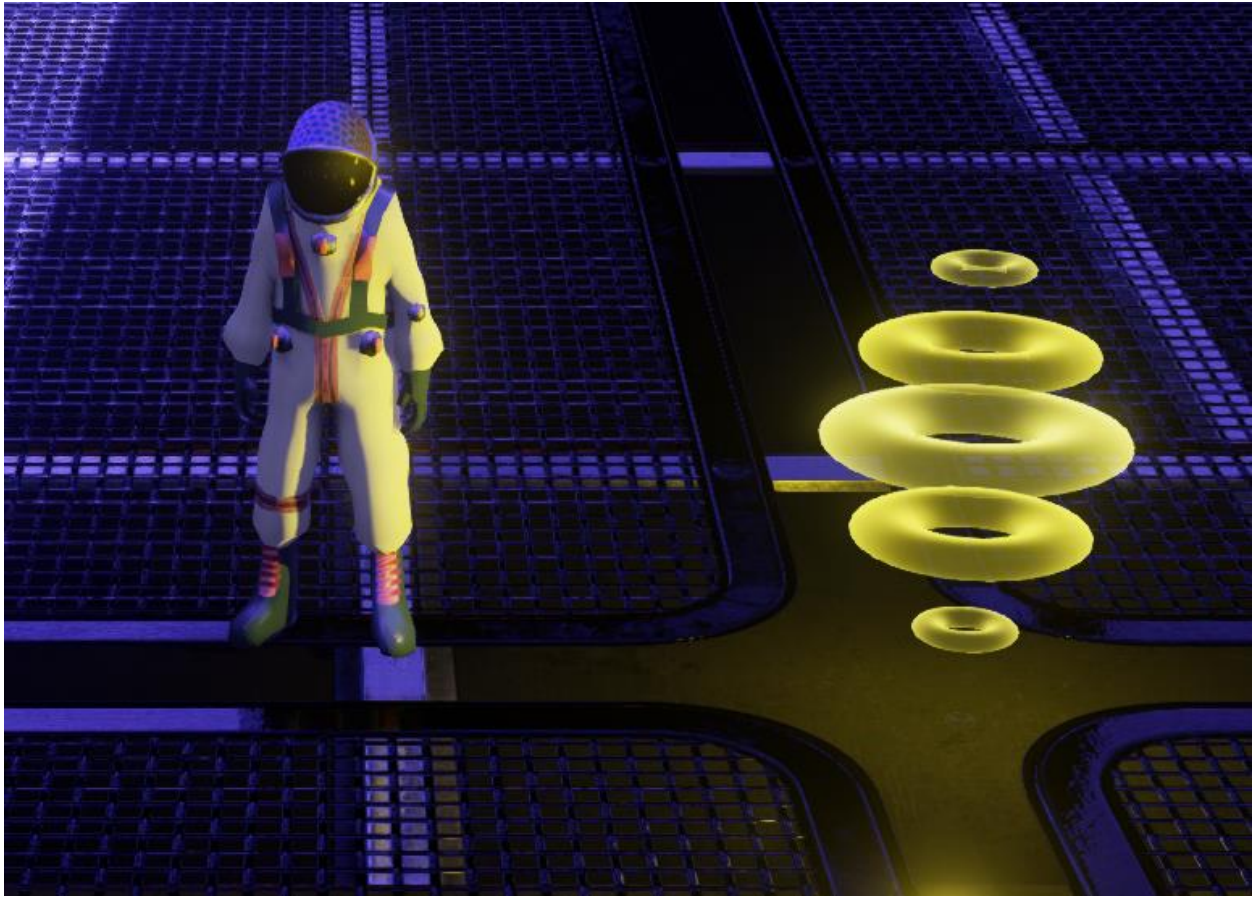
5.5.4   Light Switch

Light switches consist of a moving, yellow, cylindrical effect. When the player or other objects in the scene land on a light switch, the light switch is activated. The switch's color shifts to green, and a wormhole back to the hub appears, giving the player an exit from the level they have now successfully completed.

5.5.5 Pinball
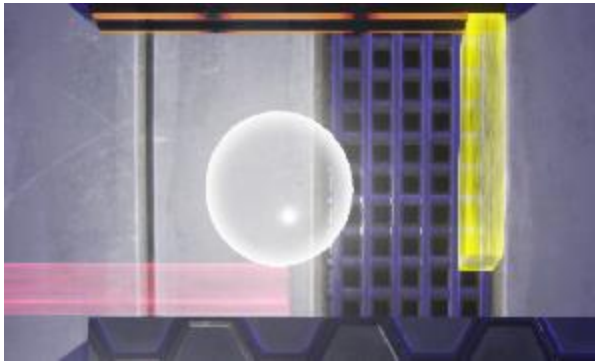
The pinball is utilized exclusively within the Pinball Level, and is a spherical object covered in a bright, emissive material, making it easy to locate. Within this level, rather than navigating the Astronaut to the goal, they must instead navigate the pinball through a puzzle-ridden track with the use of warpable objects. When the end of the track is reached, the pinball can activate a light switch, which then spawns a wormhole for the player to go through. Should the pinball fall off the track at any point, it respawns at the beginning of the track.

5.5.6 Secret Shark Raincloud
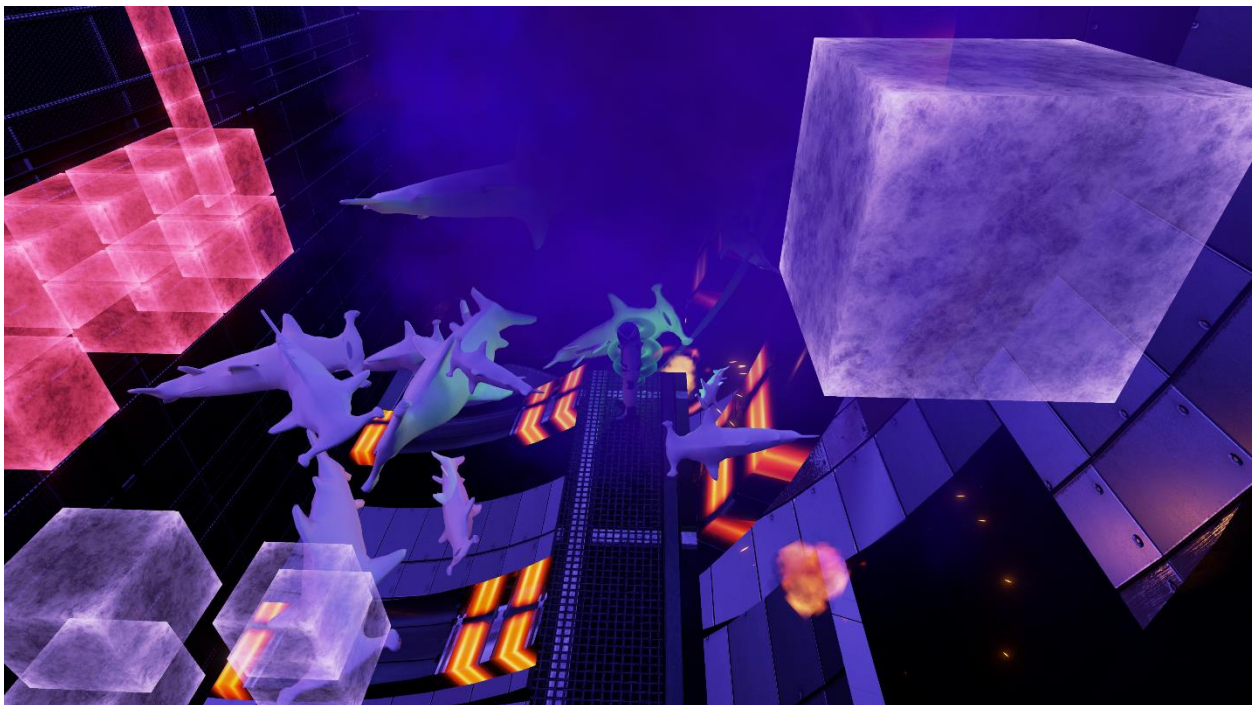
Another Easter Egg hidden within the game, when the player activates a hidden light switch within the hub level, a raincloud appears over the player's head. For about ten seconds, randomly-sized shark meshes begin to rain down from the cloud, exploding comically shortly after reaching the ground. Following this short interval, the cloud disappears.

6 Technical Information

6.1 Singletons

6.1.1 SingletonProvider

Singletons are provided via a SingletonProvider object. The SingletonProvider is initialized when a level begins play. After the Singletons are initialized they should not be reinitialized, though their internal data may change during gameplay.

6.1.2 TargetableSingleton

The TargetableSingleton will keep track of the TargetableTrackers in the level. It also loads and provides the appropriate TargetableTracker when it is needed.

6.1.3 CheckpointSingleton

The CheckpointSingleton keeps track of the checkpoints in the level. It is responsible for providing the appropriate checkpoint when the player needs to respawn. The CheckpointSingleton calls into the LevelStateSingleton to get the appropriate level reload information after a player dies.

6.1.4 LevelStateSingleton

The LevelStateSingleton provides the current level state. The LevelStateSingleton is responsible for providing the appropriate LevelInformation when the level is reloaded. An example of this responsibility is resetting blocks which may have moved out of place when the player dies.

6.2 Targeting System

6.2.1 TargetableComponent

TargetableComponents can be attached to an actor to register it with the targeting system. A targetable component will use the pivot of the actor as the location for targeting. Targetable components must be registered with a TargetableTracker, or they cannot be targeted.

6.2.2 TargeterComponent

TargeterComponents can be attached to an Actor that uses the targeting system. A TargeterComponent will use the current camera to select TargetableComponents from the current TargetableTracker provided by the TargetableSingleton. The TargeterComponent provides an interface which a controller may use in order to target objects.

6.2.3 TargetableTracker

TargetableTrackers keep track of TargetableComponents. Each TargetableTracker updates a fixed number of TargetableComponents each frame. The current TargetableTracker is provided via the TargetableSingleton. A TargeterComponent can only target Targetables which are being tracked by the current TargetableTracker.

6.2.4 TargetableTrackerVolumetricLoader

TargetableTrackerVolumetricLoaders are attached to their corresponding TargetableTrackers. The volumes signified by these objects make it such that, when the player character is standing within the volume, the objects in the TargetableTracker that the TargetableTrackerVolumetricLoader is associated with are targetable for the player. This essentially makes it so that targetable objects are only targetable when the player is in the proper area to do so, and thus the player cannot target objects they cannot see.

6.3　　　　Loading System

6.3.1　　　LoadVolume

LoadVolumes allow data to be loaded into their appropriate singletons when they are overlapped. This is used to prepare a gameplay area. These volumes are mainly responsible for updating the singletons and activating important Actors.

6.3.2　　　UnloadVolume

UnloadVolumes allow data to be unloaded from singletons when they are overlapped. These are used to tear down a gameplay area. These volumes are mainly responsible for making sure that Singleton objects don't hold any important data after an area is out of scope. They are also responsible for deactivating unimportant actors.

6.4　　　　Saving System

6.4.1　　　LevelState

LevelStates provide reload and update methods. The reload method resets the level state when the player dies, returning certain objects to their original positions while allowing other objects to retain their old positions. The update method allows the level state to be updated so that important events can be saved when the player completes a section of the level.

6.5　　　　Checkpoint System

6.5.1　　　Checkpoint

Checkpoints are locations that the player appears at following death. The current checkpoint is stored in the CheckpointSave which is responsible for respawning the player at the current checkpoint when the player dies.

6.6   Camera System

6.6.1   CameraTrack

The CameraTrack is the track a camera travels on during gameplay. As the player moves around in the level, the camera will move on this track.

6.6.2   CameraAdvancementVolume

CameraAdvancementVolumes consists of colliding geometry and a direction. While colliding with the geometry, the camera will advance as the player moves in a certain direction.

6.6.3   CameraPoint

A CameraPoint is a fixed point that the camera may be stuck at. When the camera is stuck at a CameraPoint its location will not change at all. The rotation of the camera may still be updated though, allowing it to constantly look at the player.

6.6.4   CameraRail

A CameraRail is a one dimensional space that the camera travels within, following the player at a fixed distance. The camera may move in any direction when bound to a CameraRail. The direction of movement is dictated by the shape of the rail.

6.6.5   CameraPlane

A CameraPlane is a two dimensional space the camera travels within, following the player at a fixed distance. The camera will only move in two directions when bound to a camera plane. For example, if the camera only followed in the X and Y directions in a CameraPlane then the camera would not move up and down when the player jumped.

6.6.6   CameraVolume

A CameraVolume is a three dimensional space the camera travels within, following the player at a fixed distance. If the player moves in any of the cardinal directions the camera will move equally in that direction.

6.7   Tags

6.7.1   WarpTag

WarpTag manages all of the tags of Warp. This class stores each Name used as a tag as a static constant so that it is only referenced from a single location.

7   Artwork

7.1   Visuals

7.1.1   Color Scheme

The main color scheme includes light and dark colors with dark accents on a range from red to blue. Examples of these colors are listed below:

Dark 1:   0xFF000000

Light 1:   0xFFC3C3C3

Light 2:   0xFF33CCCC

Accent 1:   0xFF770816

Accent 2:   0xFF46299A

7.1.2 Textures and Materials

7.1.2.1 Player Material

The player material covers the mesh of the player. This material applies the colors of a space suit to the player.

7.1.2.2 Emissive Material

The emissive material covers many of the platforms and walls in Quantum, including the walls of the Tutorial Level, but most importantly, it covers the targetable entities. If a non-targetable entity is covered with an emissive material, then it is colored with either Light 1 or Light 2. If a targetable entity is covered with an emissive material, then it is colored with Accent 1 or Accent 2.

7.1.2.3 Black Hole Material

The black hole material covers spherical objects and makes them appear as black holes. The material is applied to spheres. As the center of the sphere is approached the material becomes a dark black. As the outer edge of the material is approached, warping of light from the gravity of the black hole becomes more visible.

7.1.2.4 Asteroid Material

The asteroid material covers asteroids. It resembles the surface of a real asteroid.

7.1.2.5 Ship Material

The ship material covers the spaceship. It resembles the surface of a metal spaceship.

7.1.2.6 Platform and Wall Material

The platform and wall materials are emissive materials with little to no transparency. These materials are used to construct rooms and fixed geometry.

7.1.3 Meshes

7.1.3.1 Player Mesh

The player mesh resembles an astronaut.

7.1.3.2 Cube Mesh

The cube mesh resembles a cube.

7.1.3.3 Sphere Mesh

The sphere mesh resembles a sphere.

7.1.3.4 Asteroid Mesh

The asteroid mesh resembles an asteroid.

7.1.3.5 Ship Mesh

The ship mesh resembles a spaceship.

7.2 Audio

7.2.1 Music

7.2.1.1 Main Menu Theme

The main menu theme sets a dark tone for the game. It has an ambient start which transitions

into an active theme and sets an unsettling, dark tone. It loops around every 2 minutes.

7.2.1.2 Level 1 Theme Passive

Level 1 Theme Passive is the background for the first part of level 1. It has an ambient start

which transitions into an active theme, relaxes the player and sets a dark tone. It loops every 5 minutes.

7.2.1.3 Level 1 Theme Active

Level 1 Theme Active is the background for the last part of level 1. It is extremely active and sets an air of imminence. It loops every minute.

7.2.2 Sound Effects

7.2.2.1 Menu Item Change Sound Effect

This sound effect plays when a menu item is selected. It is a short click.

7.2.2.2 Menu Item Activation Sound Effect

This sound effect plays when a menu item is activated. It is a laser-like sound.

7.2.2.3 Step Sound Effect

This sound effect plays when the player takes a step. It sounds like a person walking on a stone floor.

7.2.2.4 Jump-Landing Sound Effect

This sound effect plays when the player jumps. It sounds like a person landing on a stone floor from a jump

7.2.2.5 Target Sound Effect

This sound effect plays when an entity is targeted. It is a short, laser-like sound.

7.2.2.6 Press Activation Sound Effect

This sound effect plays when a targetable object is activated. It is a long, laser-like sound increasing in pitch rapidly.

7.2.2.7 Respawn Sound Effect

This sound effect plays as the player is re-spawning. It gives the impression of zooming through space. It increases in pitch as the re-spawn video is played.
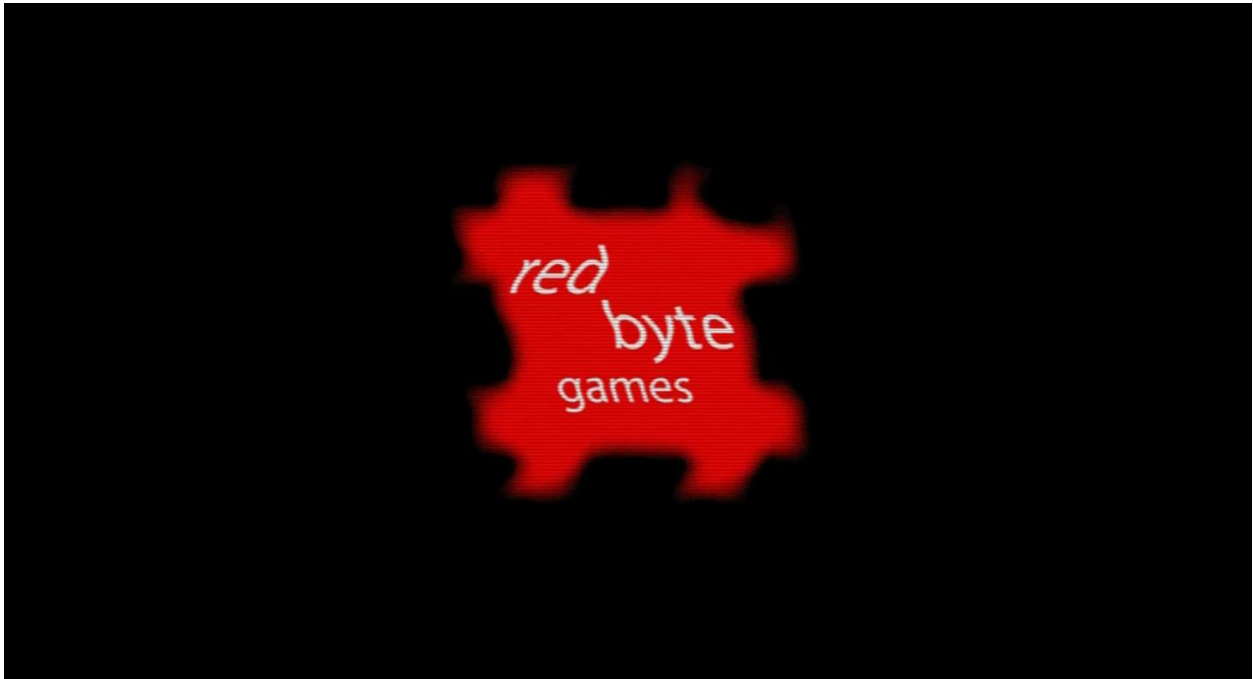
7.3 Videos

7.3.1 Unreal Logo Video

This logo is displayed shortly when Warp is first started. It displays the Unreal Engine Logo which is a requirement by Epic Games.
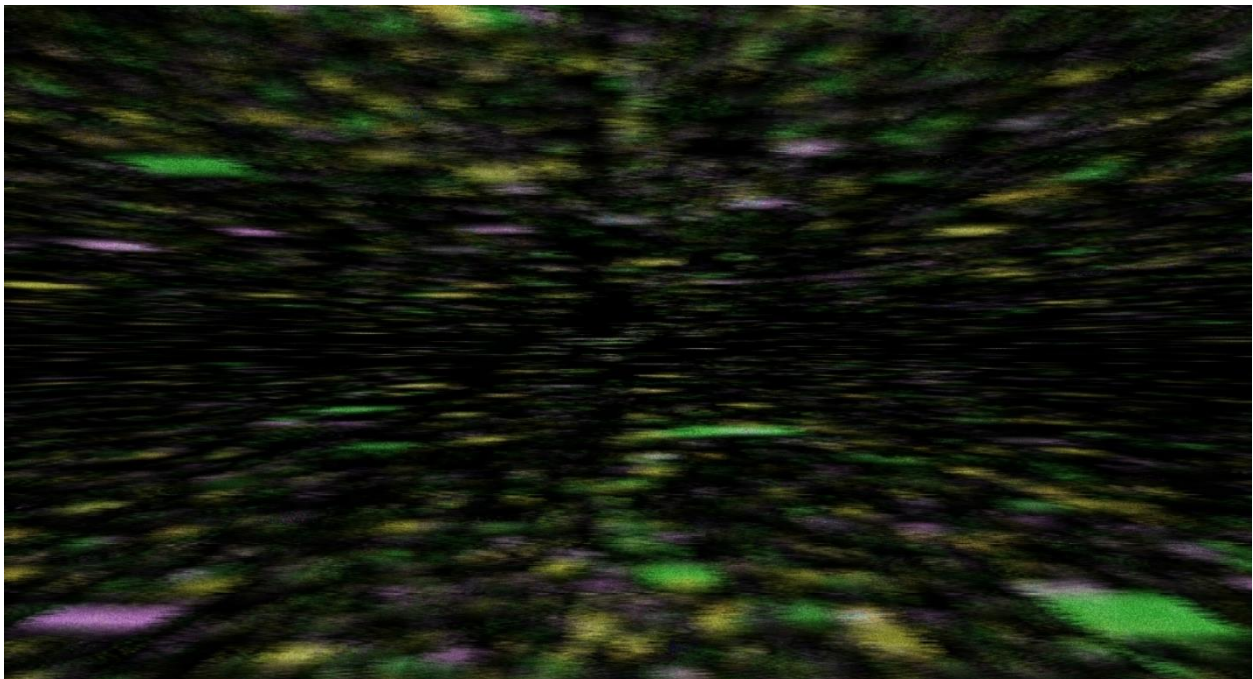
7.3.2   Redbyte Logo Video

This logo is displayed shortly following the Unreal Logo. It displays the Redbyte Games Logo before fading it out to static.

7.3.3   Player Re-spawn Video

This video is played when the player dies and is re-spawning. It provides a transition from the player's death scene to the beginning of the level.

7.4   Matinees

7.3.1   Credits Matinee

This matinee plays during the credits sequence for the game. The spaceship is seen flying towards a black hole, and emerging from the black hole are text meshes for the creators of the game, and various companies which provided resources for development. As the ship crashes into them, the blocks of text shatter into pieces.

7.5   Skyboxes

7.5.1   Nest Skybox
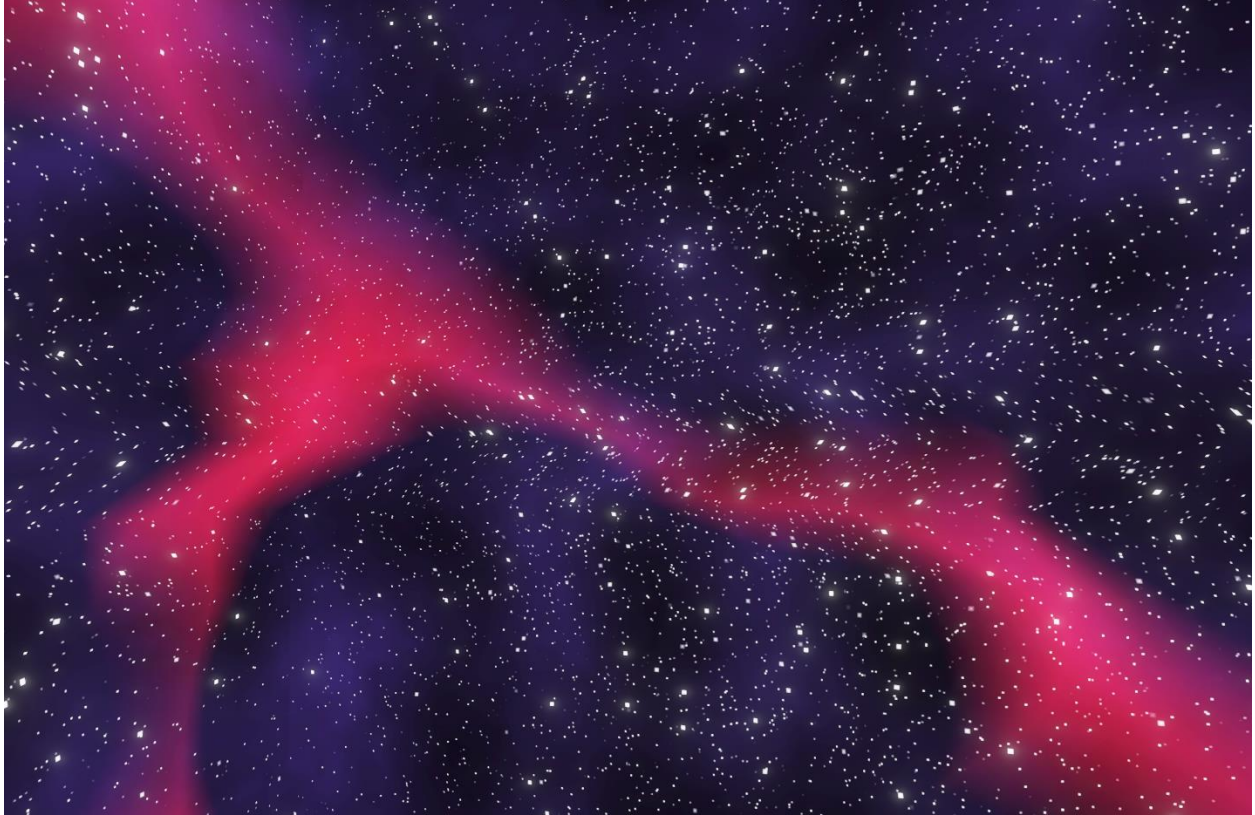
Nest is a dark galaxy with a nebulous streak of red across the sky and a dark blue, hazy cloud visible in the background.

7.5.2 Black Hole Skybox
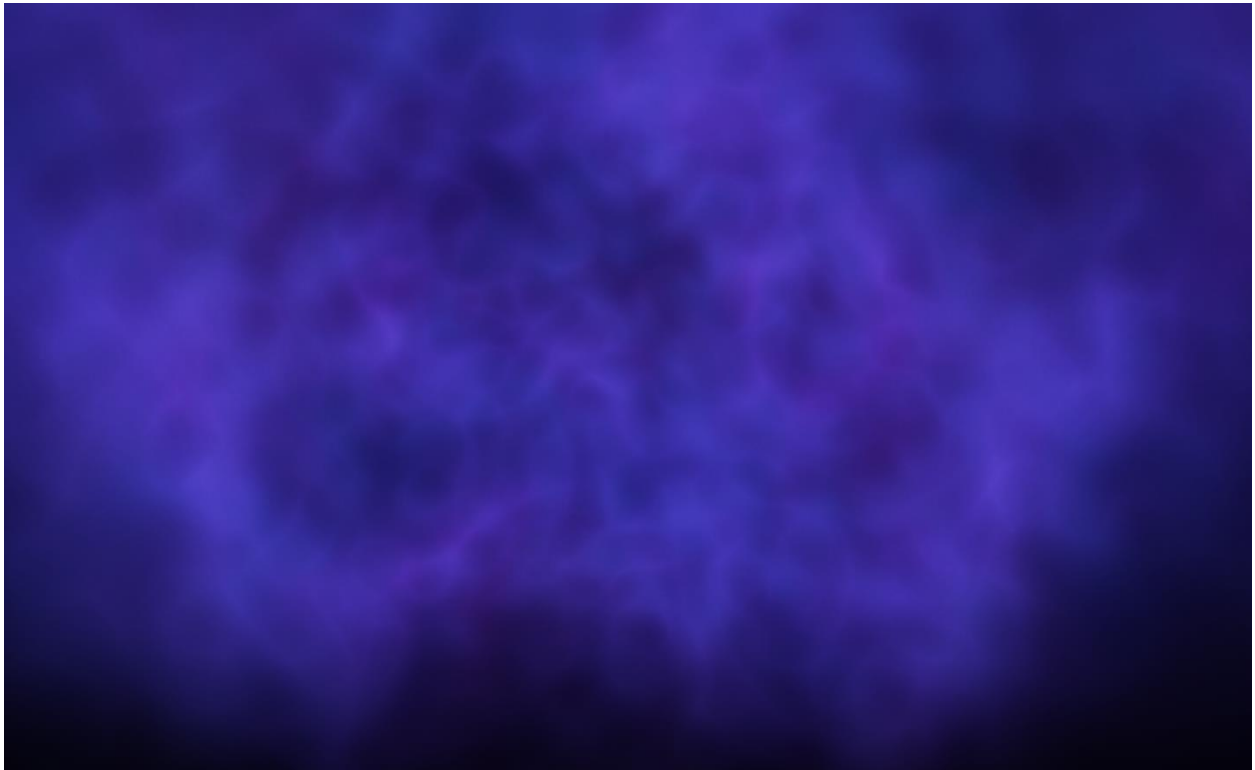
The black hole skybox represents the interior of a black hole. The skybox is filled with a dark purple. The skybox fades from its darkest point at the bottom to its lightest point at the top. This gives an impression that the light is being absorbed near the bottom, and thus that falling would kill the player.
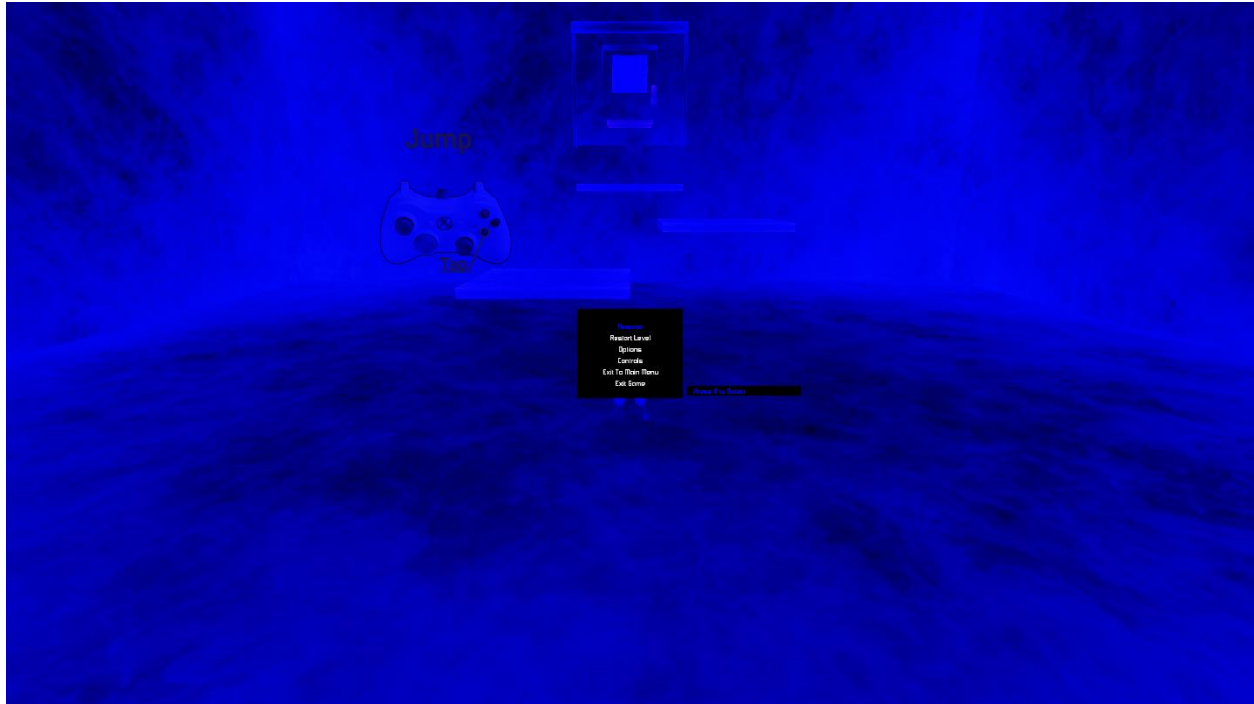
8   Menus

8.1   Main Menu

The main menu is the first menu displayed when Warp begins. It appears after the Unreal

Engine Logo and the Redbyte Logo videos play. The menu features only a "Press Start" option which

begins gameplay. The menu features the player standing on a platform suspended in face facing a black

hole. This scene also features the nest skybox.

8.2　　Pause Menu

    The pause menu is displayed when the player pauses the game. It causes the current scene to fade to one of several colors with text options superimposed over the scene inside a black box. This menu contains a quit option to end the current gameplay session and return the player to the main menu and a continue button to continue the current gameplay session. In addition, there are options for restarting the level, as well as an "options menu" which offers the ability to change volume and graphics settings, and a "controls menu" which shows a list of controls.

9　　Levels

9.1　　Demo Level

9.1.1　　Vision

    You have fallen into a black hole and are trapped within the great, enveloping, and cosmic darkness. Looking forwards, you see a strange, alien structure, mysterious and unsettling in its vastness,

the only object afloat in this endless expanse. Throughout this void are mysteries beyond the minds of men. Cubes of light suspend themselves in the aether: some are still and some are moving to and fro. As you examine the cube, you notice that its end leads unto another and that end unto yet another still. It is by following this path that you may make your escape.

9.1.2   Design Objectives

This focus of this level is solving puzzles using the targeting system. With a tone of wonder, the level conveys the message that the player is in a black hole. The level never punishes the player severely for poor platforming skills. 90% of the players are 100% successful.

9.1.3   Environment

The main features of the environment are the structure through which the player wanders, and the strange, dark lighting of the sky. The structure is immense, and varied in its structure. On one portion of the structure, a gigantic, cylindrical capsule spins silently. Throughout, the air is permeated with both tension and wonder. How will you make your escape?

9.1.4   Level Layout

Note: In addition to the layout of the game listed here, there is an easy mode. This mode essentially features cut down, easy versions of the levels described in this section, in order to provide less of a challenge for casual players, as well as to integrate properly with the Oculus Rift experience.

Section Time: 20 Seconds
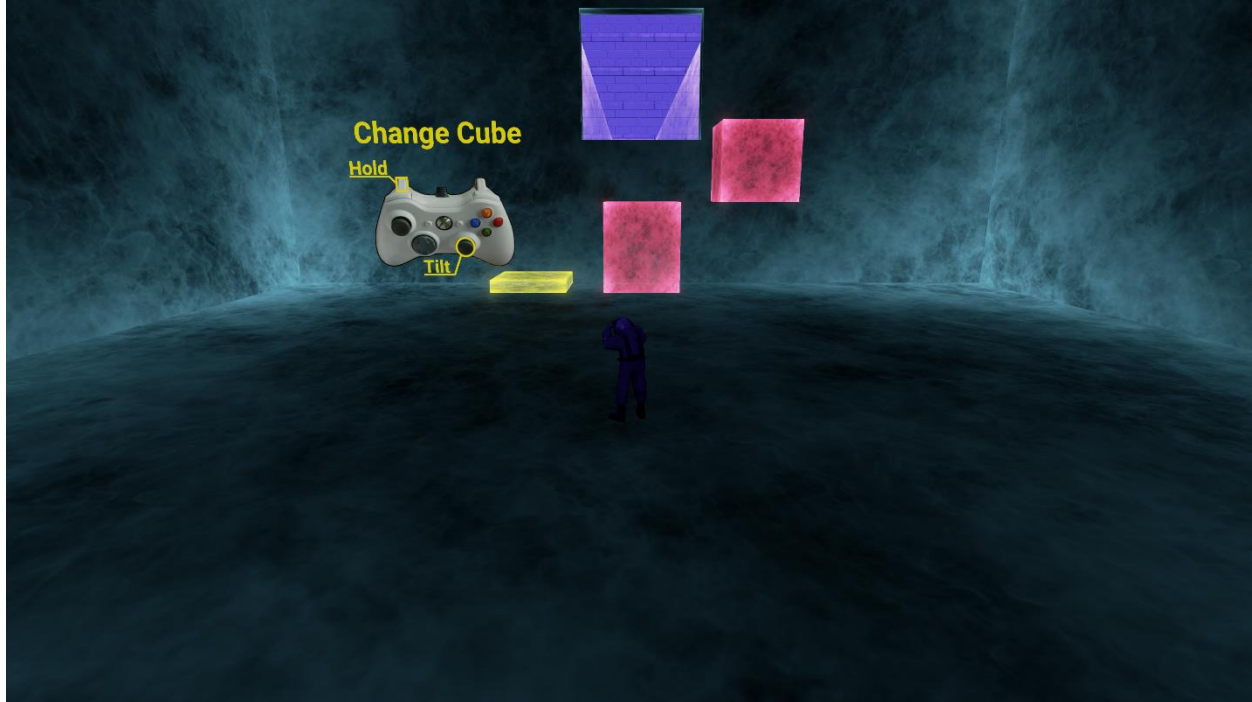
Accumulated Time: 20 Seconds

The player finds themselves inside a featureless, ethereal room, with a platform leading into the next room and a single image of a controller projected onto the wall, with the controls for movement and jumping clearly displayed.

Section Time: 25 Seconds
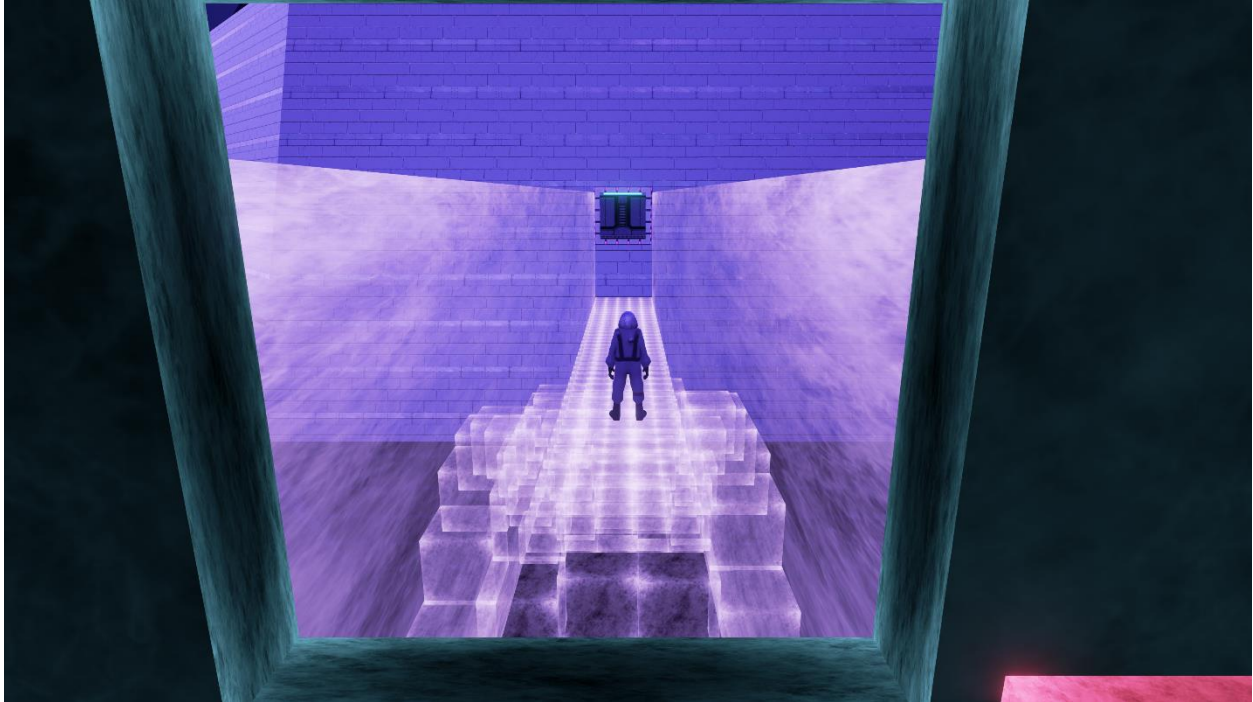
Accumulated Time: 45 Seconds

The player enters a small room with a single doorway, a similar appearance to the first room. This room contains a single cube beneath the door. The cube can be targeted and activated. The cube raises to the door when it is activated. This allows the player to jump on top of it, and elevate itself to the doorway. The player can now exit the room.

Section Time: 25 Seconds

Accumulated Time: 70 Seconds

The player enters another small room with a single doorway. This room contains three cubes beneath the door; the player can only jump onto one of the cubes. The cubes can be targeted and activated, and each cube has different behavior when it is activated. One of the cubes rises to the height of another cube when it is activated, another rotates, and the third raises itself to the height of the door, allowing the player to move on.
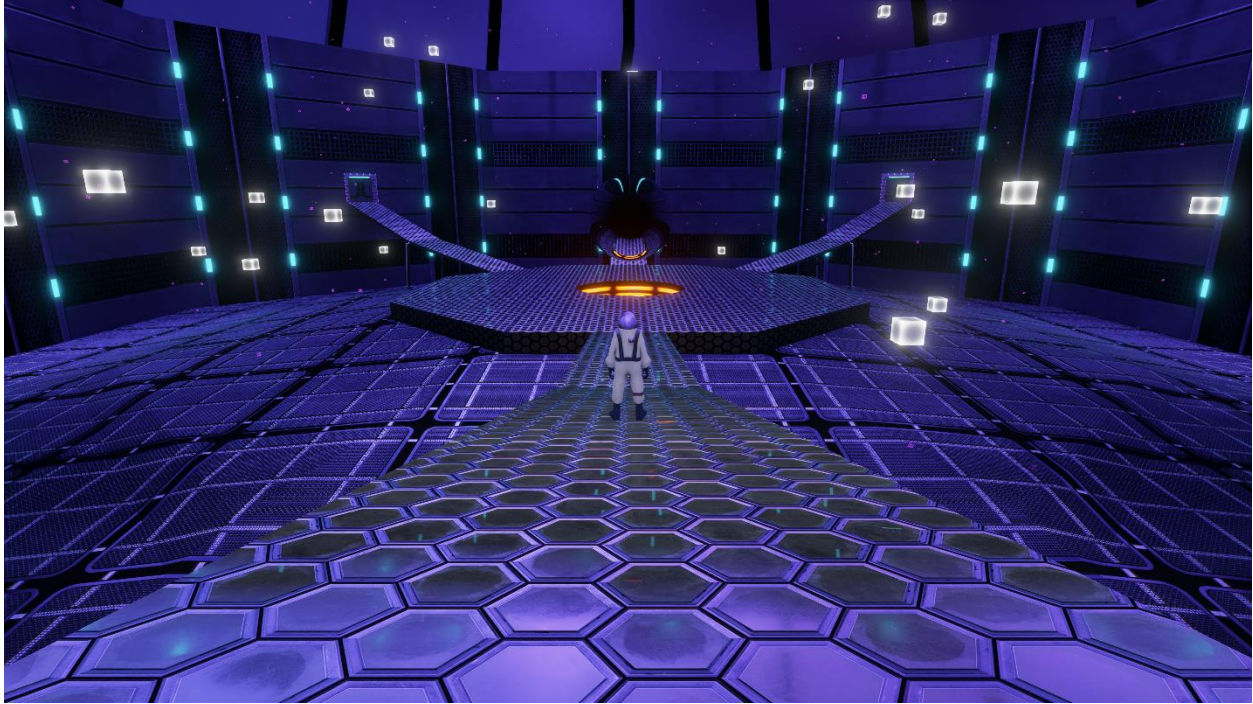
Section Time: 15 Seconds

Accumulated time: 85 Seconds

The player emerges from the room onto a platform in darkness. At the front of the platform the player finds four illuminated cubes. Approaching the cubes causes more to appear at their front. This process continues onwards, forming a straight bridge of these cubes. The player must simply walk across this bridge to gain access to the next area. To the sides of this bridge, the player sees wonders indicative of the black hole. The dark sky illuminates the area.
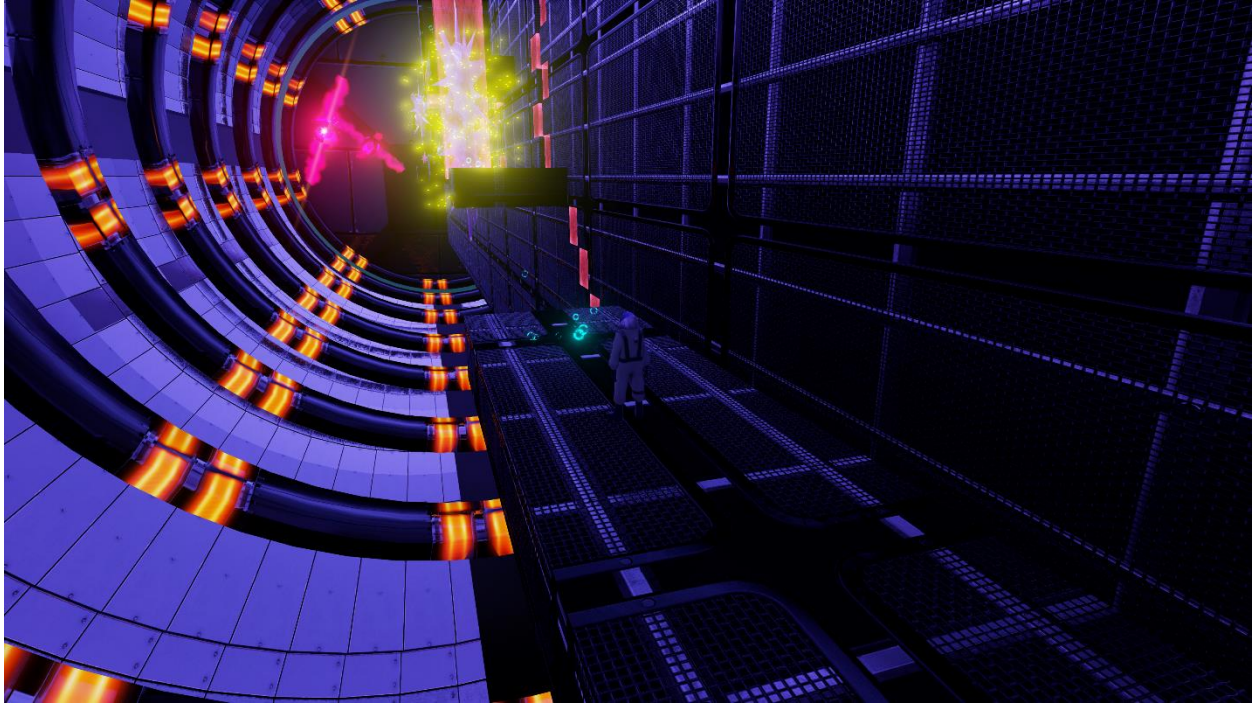
Section Time: 15 Seconds

Accumulated Time: 100 Seconds

After walking across the bridge, the player finds themselves on a platform leading to the core

puzzle room. The core puzzle room contains a small gravity well at its center; this is the only obstacle in

the entire level that can kill the player. If the player is killed by the gravity well, they are returned to the

entrance of the core puzzle room with no progress lost. To complete this puzzle; the player has to

complete two other puzzles in adjacent rooms. By completing these additional puzzles the player is able

to progress through a third, central room leading to the ending sequence.

Section Time: 300 Seconds

Accumulated Time: 400 Seconds

The leftwards room contains a puzzle which requires the player to travel along a gigantic wall encapsulated within an even larger, spinning cylinder that separates into sections when the player enters. In order to progress, the player must move cubes set into the wall so that they can climb along them. After successfully navigating to the far end of the wall, the player walks through a switch, which opens a portal back to the hub.

Section Time: 300 Seconds

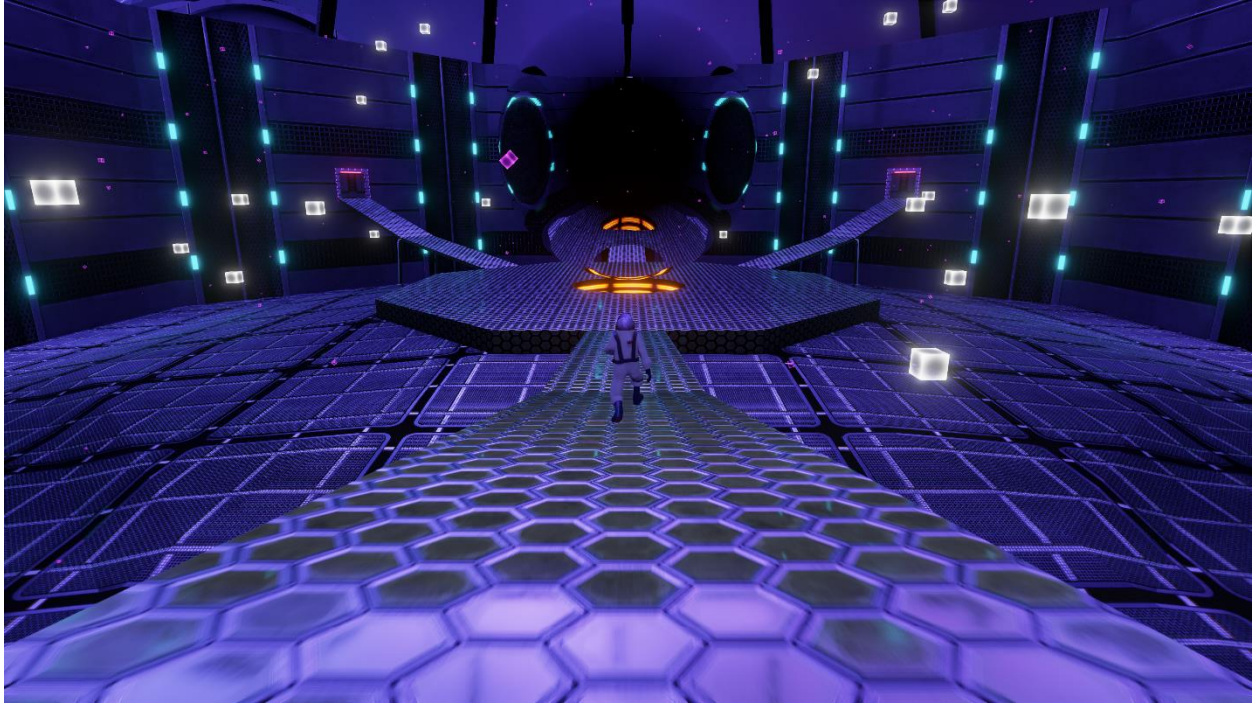**Accumulated Time: 700 Seconds**

The rightwards room contains a puzzle which requires the player to get a ball through a pinball maze. The ball can be controlled using translatable, rotatable, and scalable components; these components collide with the ball, launching it in various directions. When the ball gets to the end of the maze, it passes through a switch which opens a portal back to the hub.

Section Time: 30 Seconds

Accumulated Time: 730 Seconds

When the player returns to the core area, having completed the puzzles in the adjacent rooms, they find the gravity well in the center of the room has begun expanding, and that the only unlocked door within the room is the third, previously locked door on the far end. Dodging around the gradually expanding black hole, the player walks up the final bridge, and into the last doorway.

Section Time: 90 Seconds

Accumulated Time: 820 Seconds

As the player runs through the last doorway, they come to a final light bridge. Travelling across the bridge, they must dodge blocks which move towards them. They are pushed backwards by them, toward the ever-expanding gravity well if they fail to do so. If the gravity well reaches the player, they will be sucked in and will have to restart the sequence from the last checkpoint. If they succeed in reaching the end of the bridge, the blocks stop spawning. The player must then utilize the Quantum spheres placed against two walls, picking the correct spheres to progress past the obstacles while dodging both a Death Ball and two Emit Turrets. Finally, the player jumps through a small hole, which leads to a stairway at the base of a platform upon which the player's ship rests, providing a final escape from the black hole.

Section Time: 90 Seconds

Accumulated Time: 910 Seconds

A matinee is displayed, showing the ship flying towards the entrance of the black hole. As the ship flies to this goal, the names of the developers, as well as companies that specifically provided resources for development of the game, are crashed through by the ship, shattering to pieces when they are hit. Once they reach the end, the game thanks the player for playing.

10 Development Tools

10.1 Unreal Engine 4.7

Unreal Engine is used as the engine for the game. It is granted on an educational license.

10.2 Visual Studio 2013

Visual Studio is used to modify the source code for the game. It is granted on an educational license.

10.3 Perforce

Perforce is used for version control; it is granted on a freeware license.

10.4   Microsoft Azure

Microsoft Azure is used to host Perforce Servers. A license is paid monthly.

10.5   Blender

Blender is used to create the meshes for Warp.

10.6   Adobe Creative Suite

Adobe Create Suite is used to create, modify and improve many of the art assets of Warp; this

includes images, sound and video.

10.7   Nvidia Texture Tools for Adobe Photoshop

Nvidia Texture Tools for Adobe Photoshop is used to modify skyboxes for Warp and convert them from extraneous file types to file types which can be used with Unreal Engine.

10.8   SpaceScape

SpaceScape is used to create skyboxes for Warp.

10.9   SFXR Sound Effect Generator

SFXR is used to create some of the basic sound effects for Warp. These can then be refined using Adobe Creative Suite.

10.10   Microsoft Office

Microsoft Office is used for project management. All of the project documentation exists in Microsoft Office formats.

10.11   Asana

Asana is used to keep the project on schedule and to assign work to each of the team members.

10.12   FL Studio 11

FL Studio 11 was used to create all music, and some sound effects for Quantum.