3D to 2D transitions in Platformer Games: Final Presentation

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Introduction to the problem

- This project was Inspired by Project Vertex, developed by Ross Rodney for his final year project.

- The goal is to explore and see what kind of gameplay experience could be created by switching dimensions.

- In a way, my project is an expansion on Ross's work but sprinkling in my interest in level design.

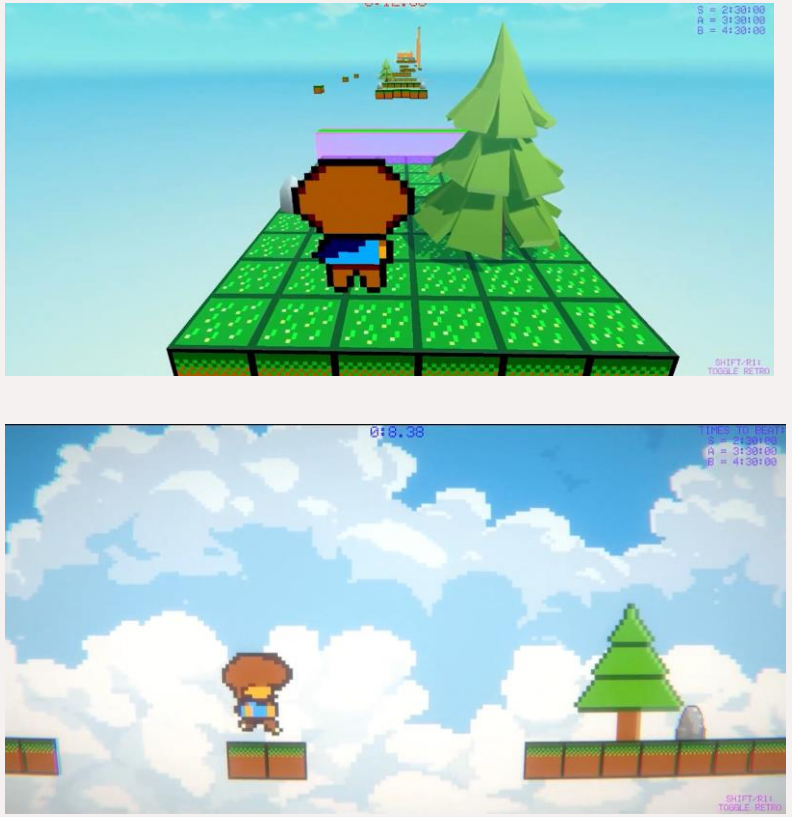


Figure 1: Screenshots from Project Vertex (Rodney, 2023)

Project aim

“The aim of this project is to investigate how the transition from 3D to 2D impacts level design and how these transitions affect player experience in terms of presence and flow in platformer games.”

Objectives 1-3

- My first four objectives remained the same, as originally shown during my project pitch in December 2024.

Objective 1. Conduct research into level design for 2D/3D platformers to identify practices, techniques, and patterns used to construct levels, and identify any key differences between 2D and 3D level design.

Objective 2. Conduct research into how the flow state and player presence Influence video game level design, and how it affects player engagement.

Objective 3. Apply the research from objective 1 and 2 and start creating a playable prototype for the product.

Objectives 4-5

- Objective 5 saw a slight tweak due to a design change during development.

Objective 4. After the playable prototype is completed and tested, start finalising and implementing the final 2D / 3D level design.

Objective 5. Evaluate the product through a user experience questionnaire and a short post-game interview conducted during a user testing session to determine which transition participants find more appealing

Background Research: Level Design

- Level can typically be broken into core gameplay components such as **platforms**, **enemies**, **hazards**, **collectables**, and more.

- To create engaging gameplay experiences, these components can be mixed or reshuffled in various ways to maintain player interest and challenge.

- Additionally, most of these components are introduced within the first five to ten minutes of gameplay (Boutros, 2006), which help support player engagement.

Celeste (Maddy Makes Games, 2018)

Super Mario 3D World (Nintendo, 2013)

Background Research: Flow

- Flow is a psychologically state described by Csikszentmihalyi (1990) as: a deep involvement in an activity, where player skills match the challenges that the game offers.

- This balance helps keep players engaged, avoiding boredom and frustration.

- Sweetser and Wyeth (2005) expand on this, identifying elements that supports flow:

- **Challenge**, **skill**, **control**, **goals**, **feedback**, **immersion**, and **social interaction**

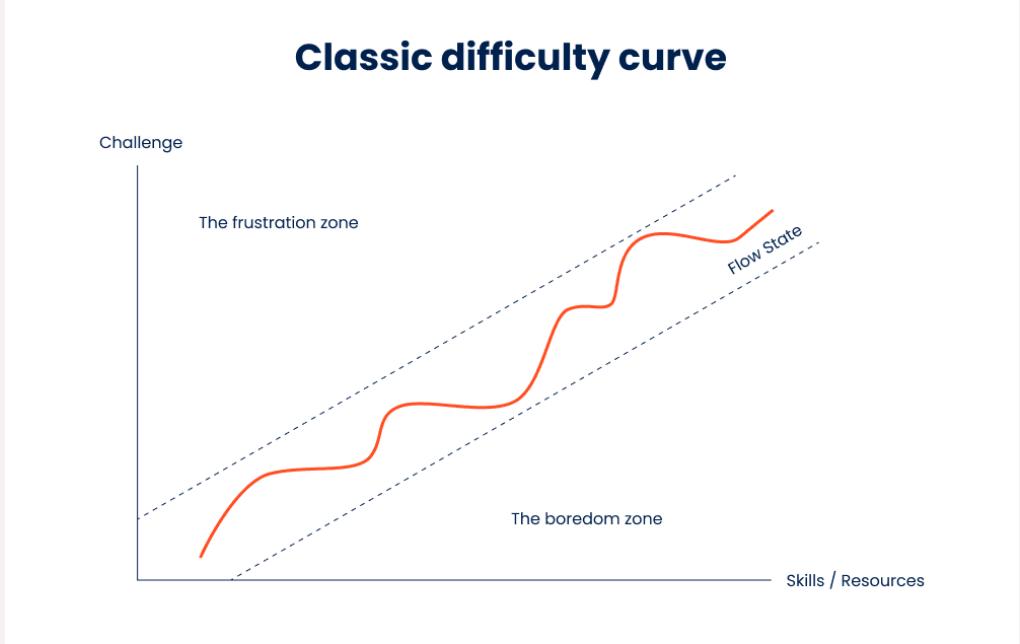


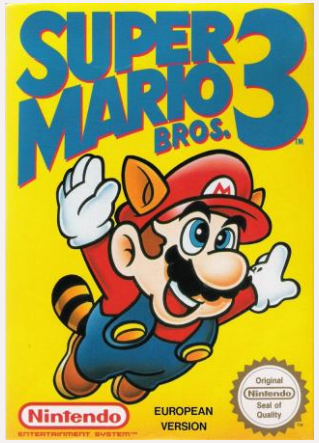
Figure 2: Flow difficulty curve Brazie (2024)

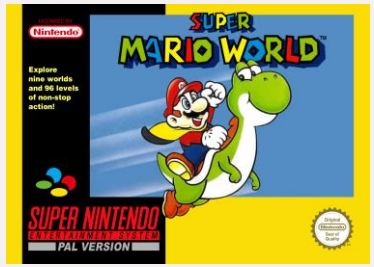
Background Research: Flow in practice

Video 1: Showcasing how the placement of elements can create flow in Super Mario World (Nintendo, 1990)

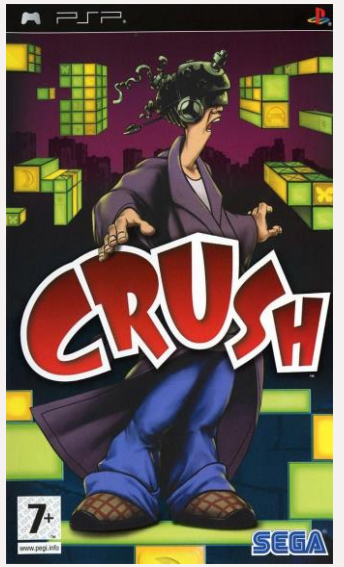
Background Research: Games

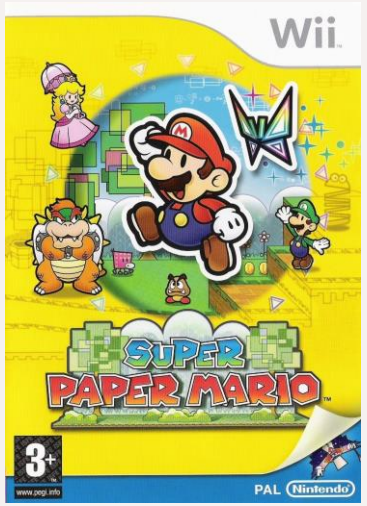
Level Design Focus:





Level Transition Focus:





Solution Design: General loop

- For the player to enter a state of flow, there must be a repetitive set of actions the player can do / perform.

- This can be broken down into three loops:

- **Short-term loop**: focuses on the immediate challenge the player will face.
- **Medium-term loop**: Progression through 2D / 3D section.
- **Long-term loop**: Reaching the end of the level.

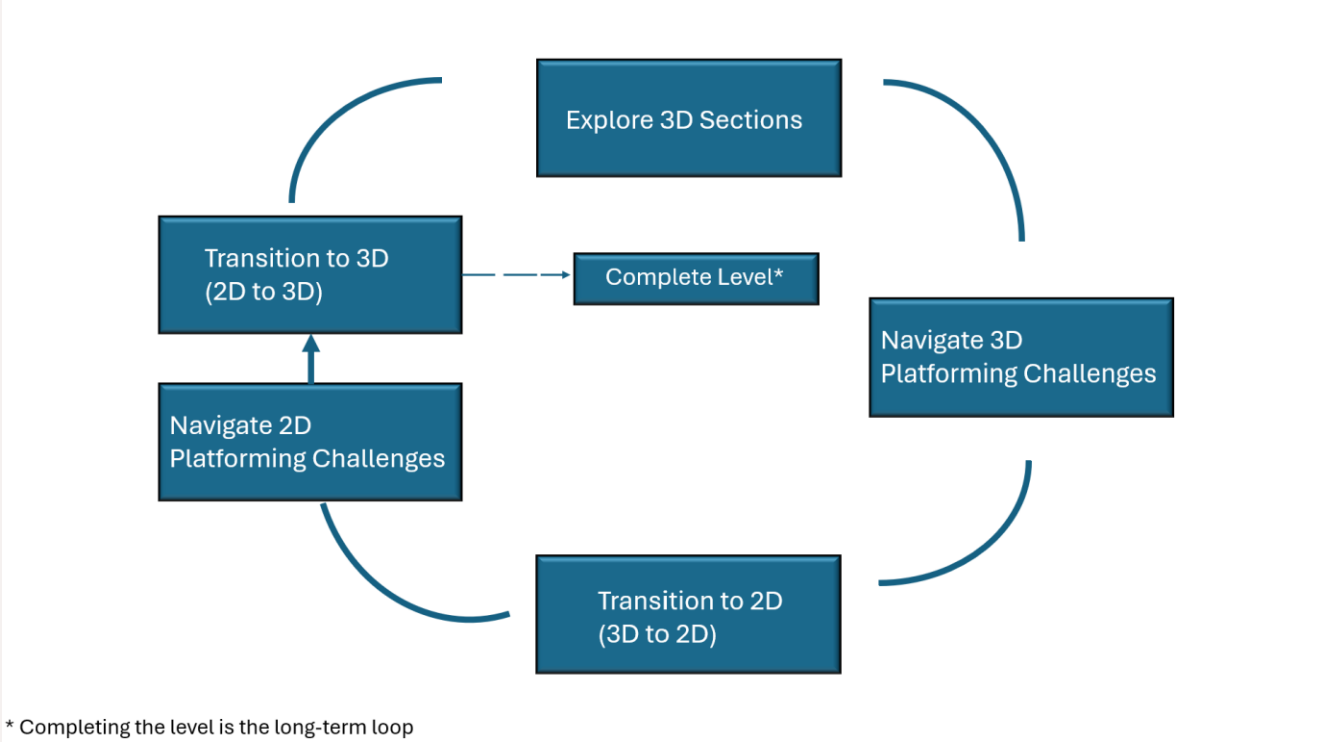


Figure 3: Diagram showcasing the general gameplay loop

Solution Design: Level Design

- The level design draws inspiration from **Koichi Hayashida's** philosophy.

- Hayashida's approach can be broken down into three steps (Nutt, 2012):

- 1) Introduce a concept in a safe space, or with a safety net
- 2) Then introduce complexity to the concept
- 3) Twist or mix the concept with existing or additional mechanics to surprise the player

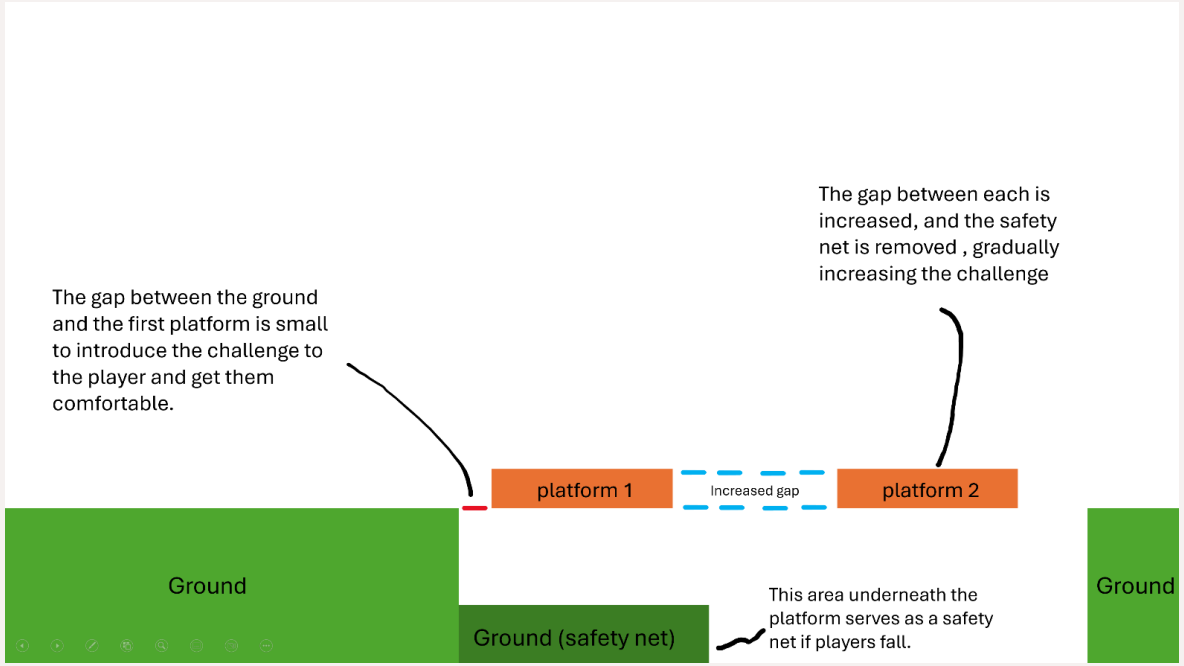
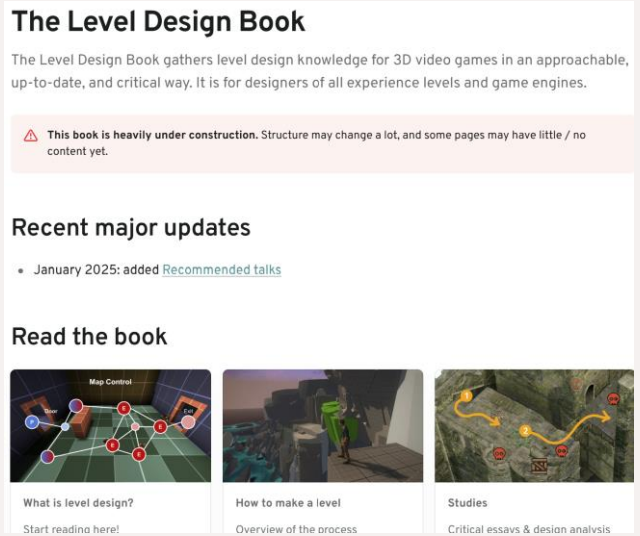


Figure 4: Visual diagram explaining gradual challenge increase through platforming

Level Design: Miscellaneous

(Lee, 2022)

(Taylor, 2013)



(Yang, 2025)

Other resources used to inform / influence my level design approach

Level Design: Miscellaneous

- One online website that was beneficial for analysing level was “noclip”.

- Noclip is a digital museum of game levels from various franchises across different console generations.

- It allowed me to explore more levels, analyse them and look for established patterns.

Level Design: No Clip example

Video 2: Using NoClip to look around a level in Super Mario Odessey (Nintendo, 2017)

Solution Design: Transitions

- Initially, I had three options available for implementing a seamless transition:
- Splines
- Cinemachine with a tracked dolly track (as the body)
- Two virtual Cinemachine cameras

- Ultimately, the decision was made to scrap that idea, and Instead the focus shifted to three different transitions animations:
- Smooth camera transition
- Black screen transition
- Countdown

Solution Design: Transitions Table

Method Name	Description	Pros	Cons
Splines	Constrains the movement of the camera along a predefined path	- Smooth camera movement - Useful for creating seamless transitions	- Required the whole level to be designed first
Cinemachine (with a dolly track camera)	Camera moves on a track and then follows the player on that track	- Smooth camera movement - Customisable	- Required the whole level to be designed first - Best suited foron-rails based gameplay
Two Cinemachine cameras	Two separate cinemachine cameras with different priorities (0-10) that can be set in code	- Easy to swap between the two - Two dedicated cameras means different properties	- The swap / transition between the two cameras can be abrupt - The swap can be noticeable during play

Table 1: The different approaches that were being considered

Solution Design: Camera

- Each dimension, 3D and 2D would have their own dedicated Cinemachine camera.
- The camera will change priority when the player hits a trigger point.
- The 2D Cinemachine camera would include concpets such as: **lookahead**, **position-snaping**, and **camera window** (Keren, 2015).

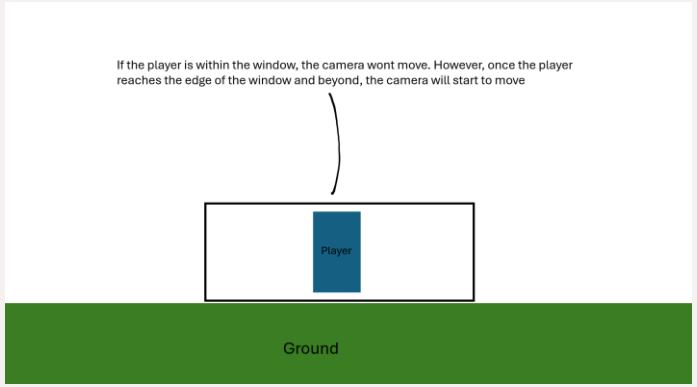


Figure 5: Visual Sketch explaining camera window

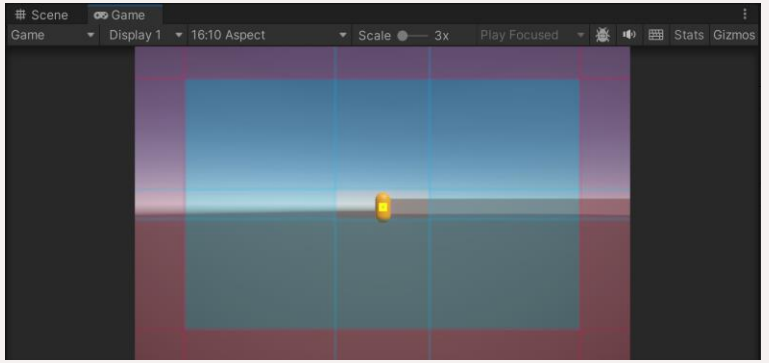
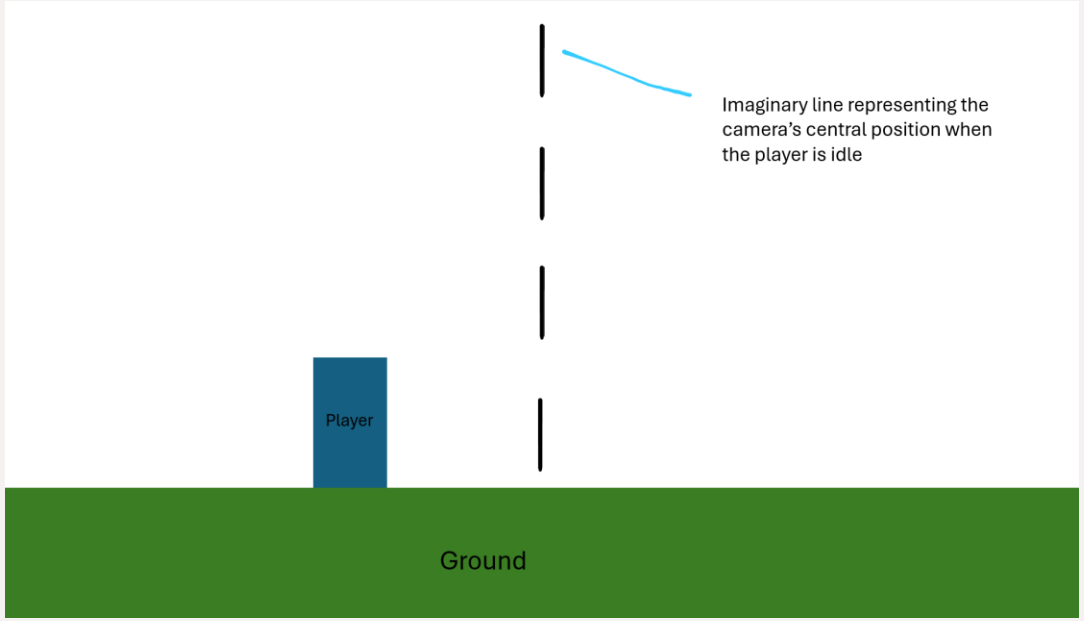


Figure 6: Example of camera window in Unity

Solution Design: Camera Contd



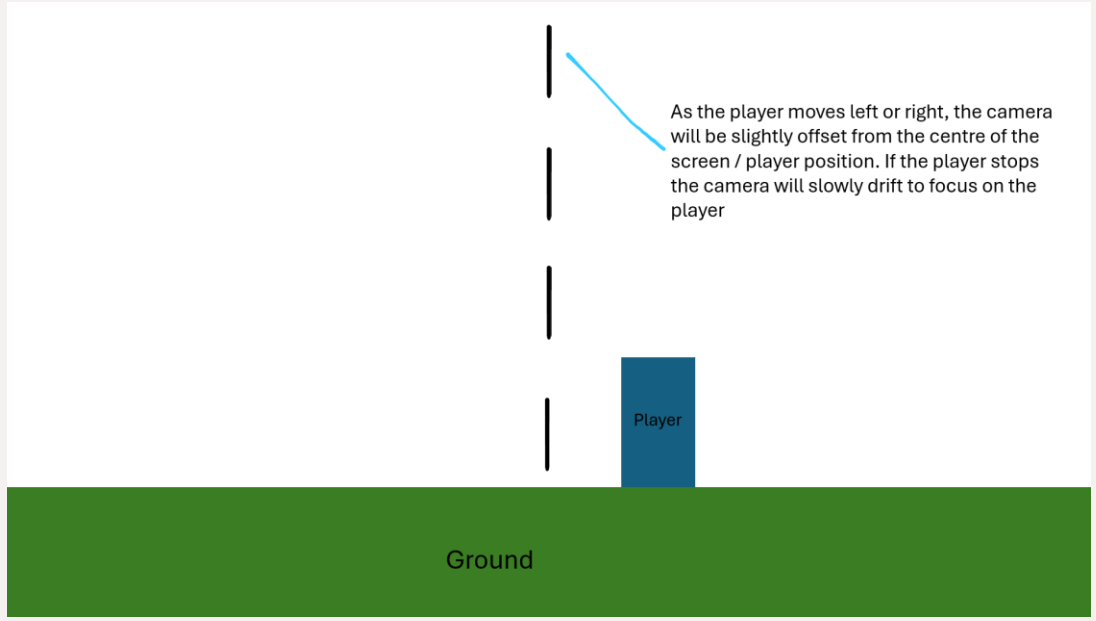


Figure 7: A visual sketch explaining camera lookahead

Solution Design: Miscellaneous

- The goal is to support both keyboard and controller, including user interface navigation.
- Using Unity's input system.
- Also, include Coyote time as a forgiveness measure.
- Coyote time will allow players to jump briefly after leaving a platform.

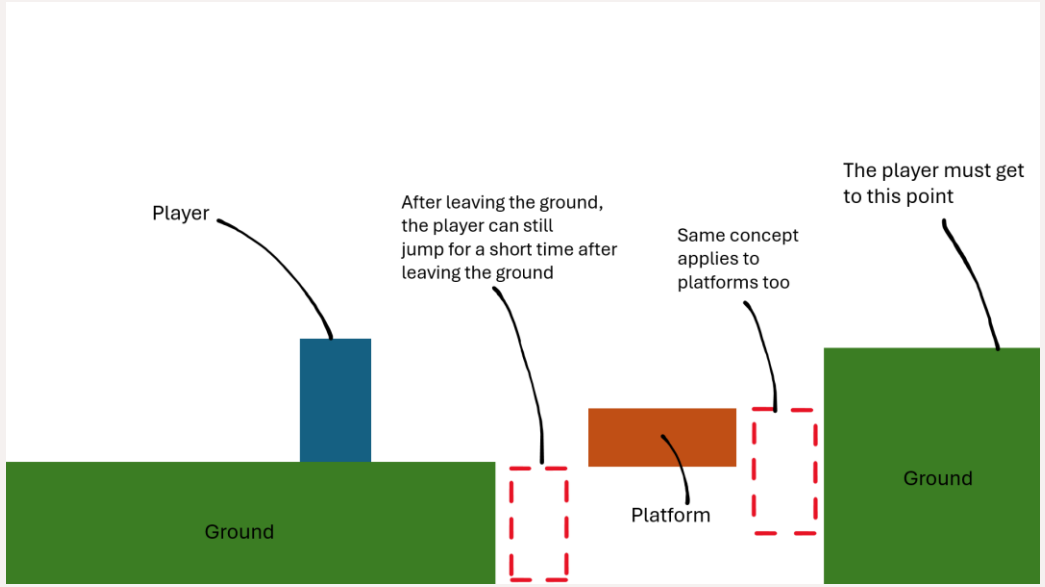


Figure 8: A visual sketch explaining the concept of Coyote time

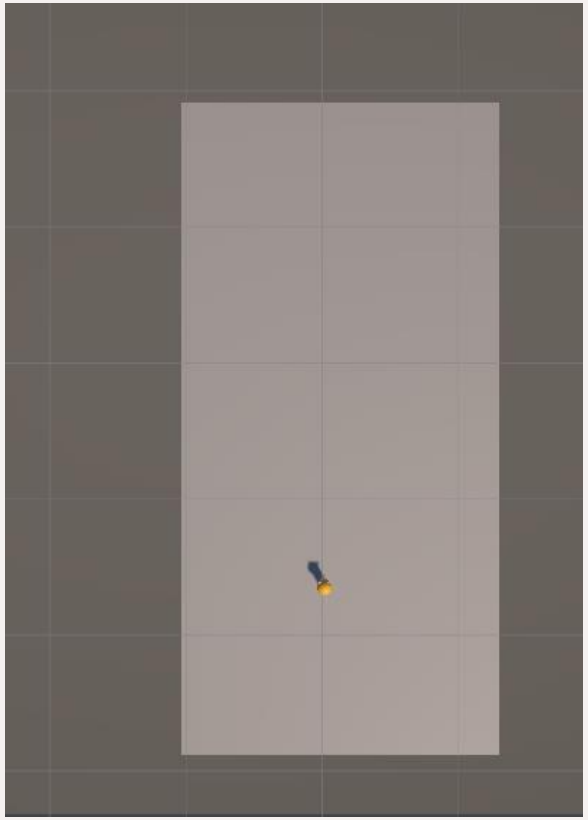
Implementation: Level Design

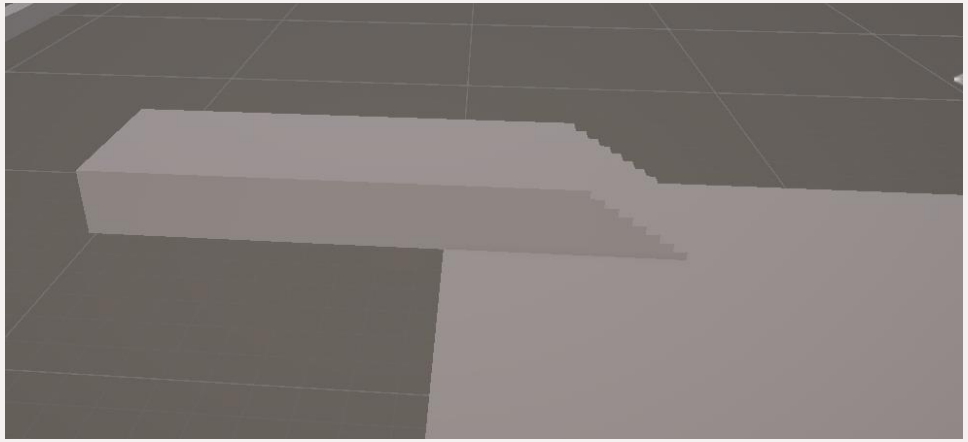
- The level was blocked out using Unity's Probuilder tool, with the final level assets added afterwards

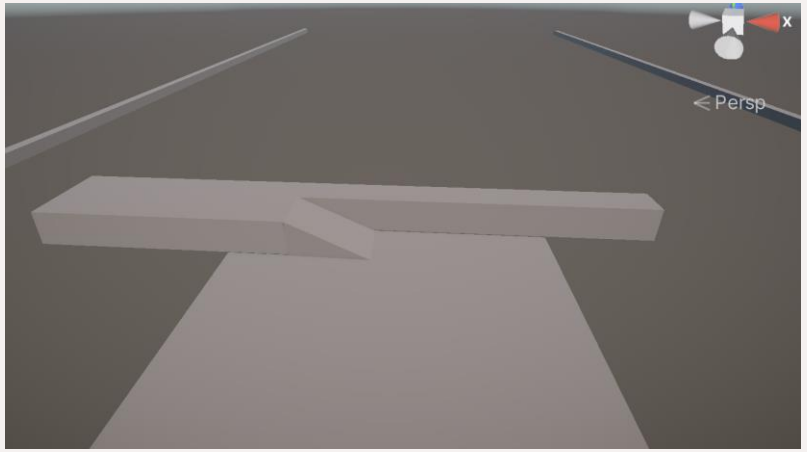
The final level includes:

- Four transitions triggers (two for each dimension)
- Five short 3D and 2D sections, each with their own platforming challenges
- Two semi branching paths, offering non-linear exploration
- Collectables used to subtly guide the player

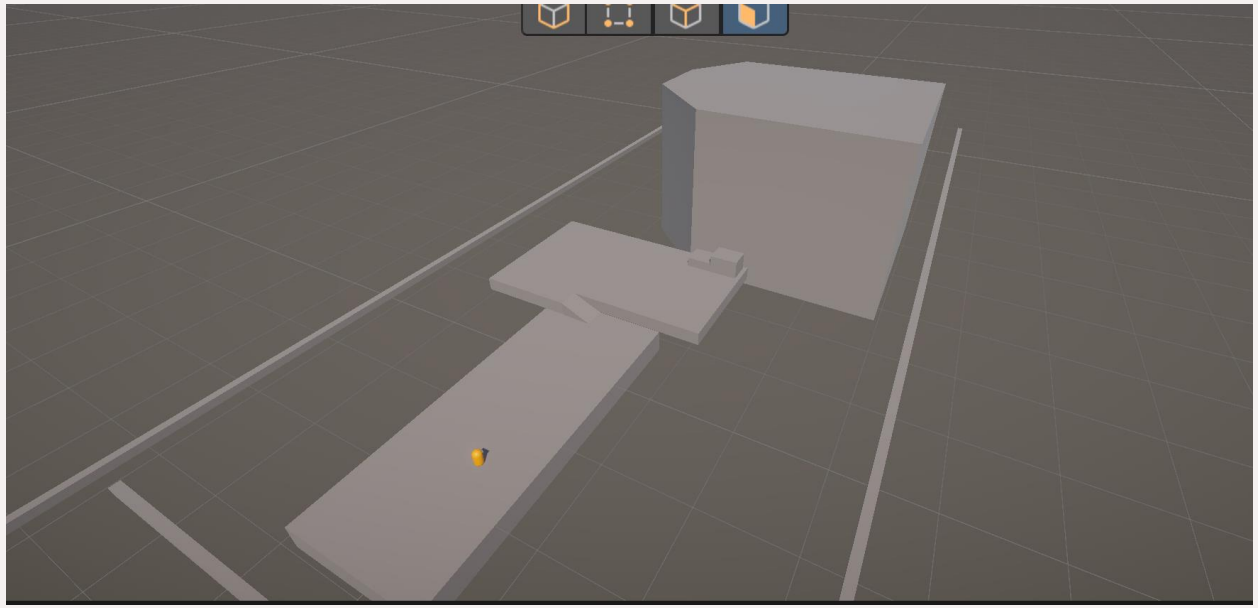
Level Design Evolution 1/7

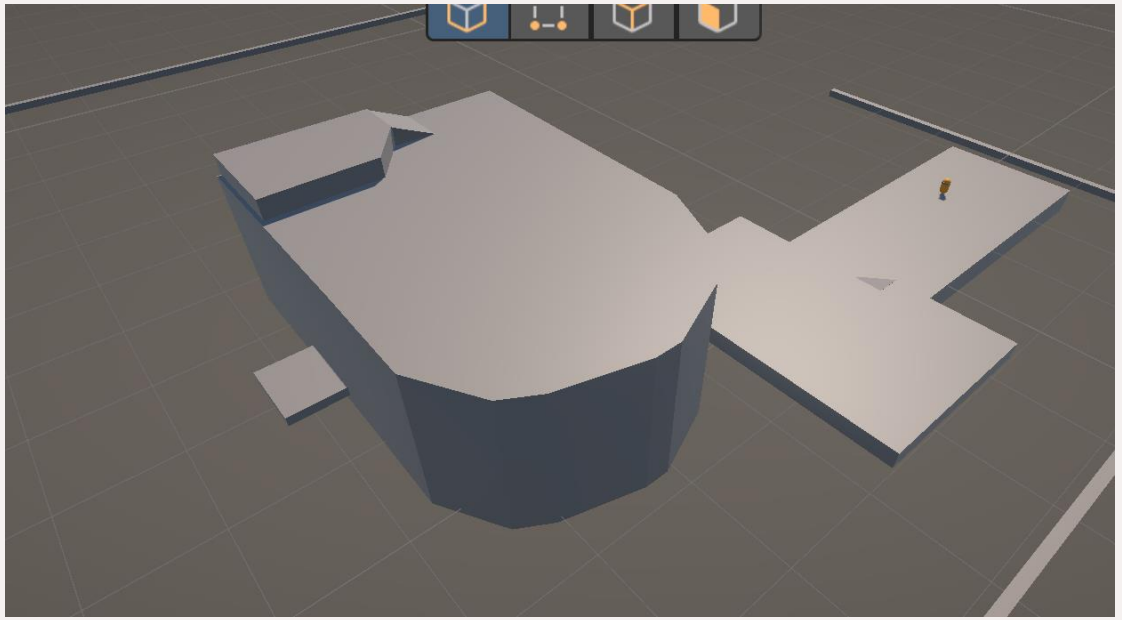




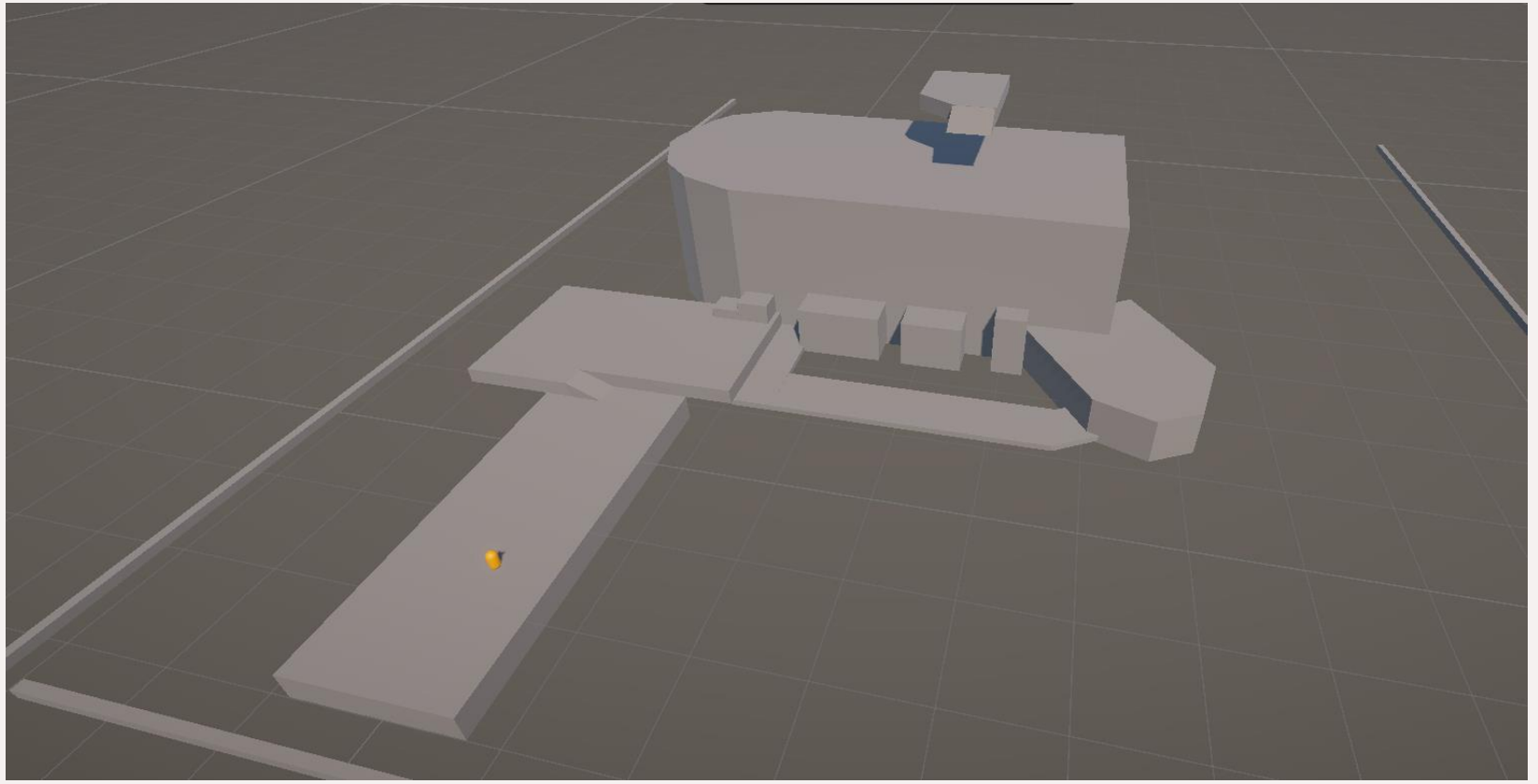


Level Design Evolution 2/7

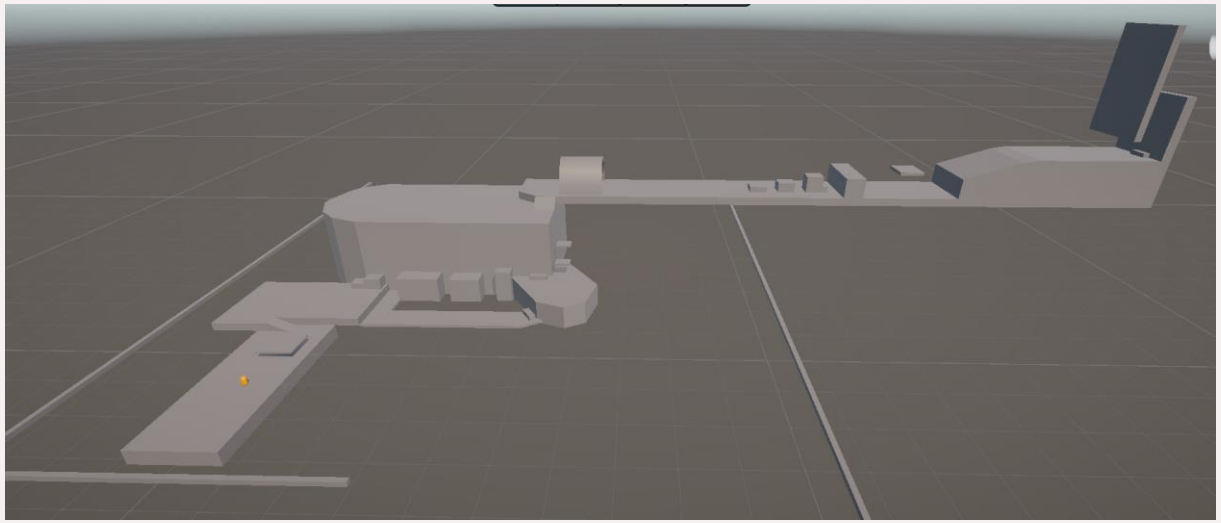


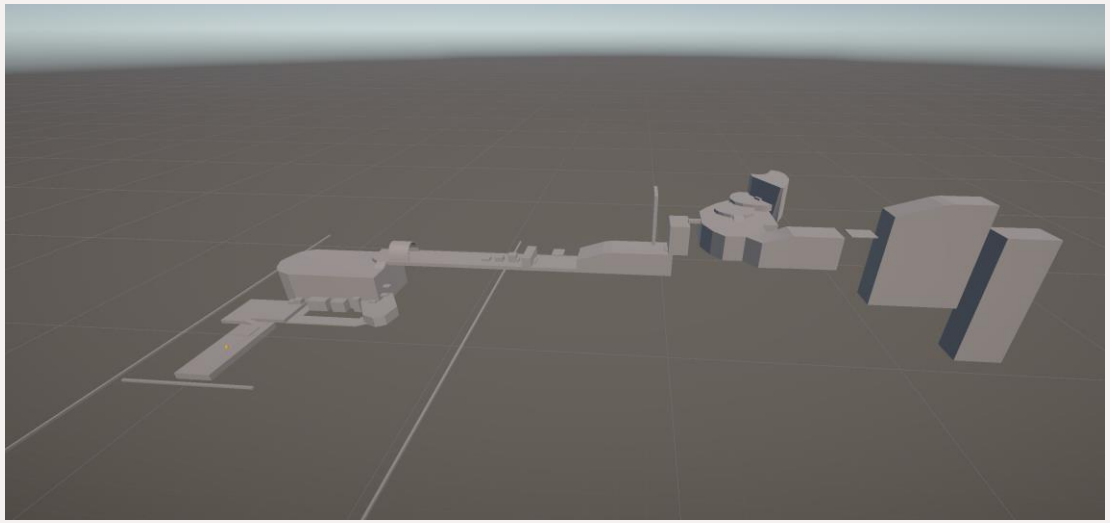


Level Design Evolution 3/7

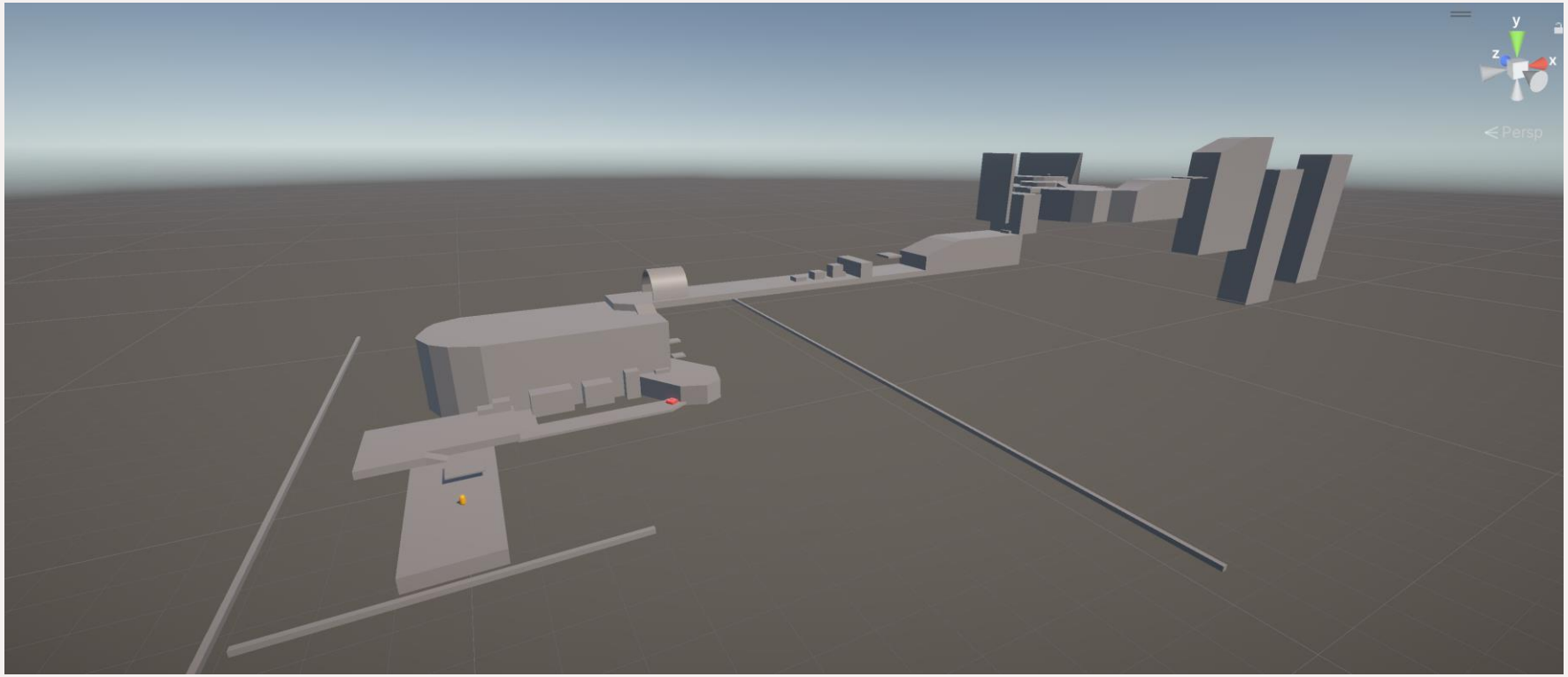


Level Design Evolution 4/7

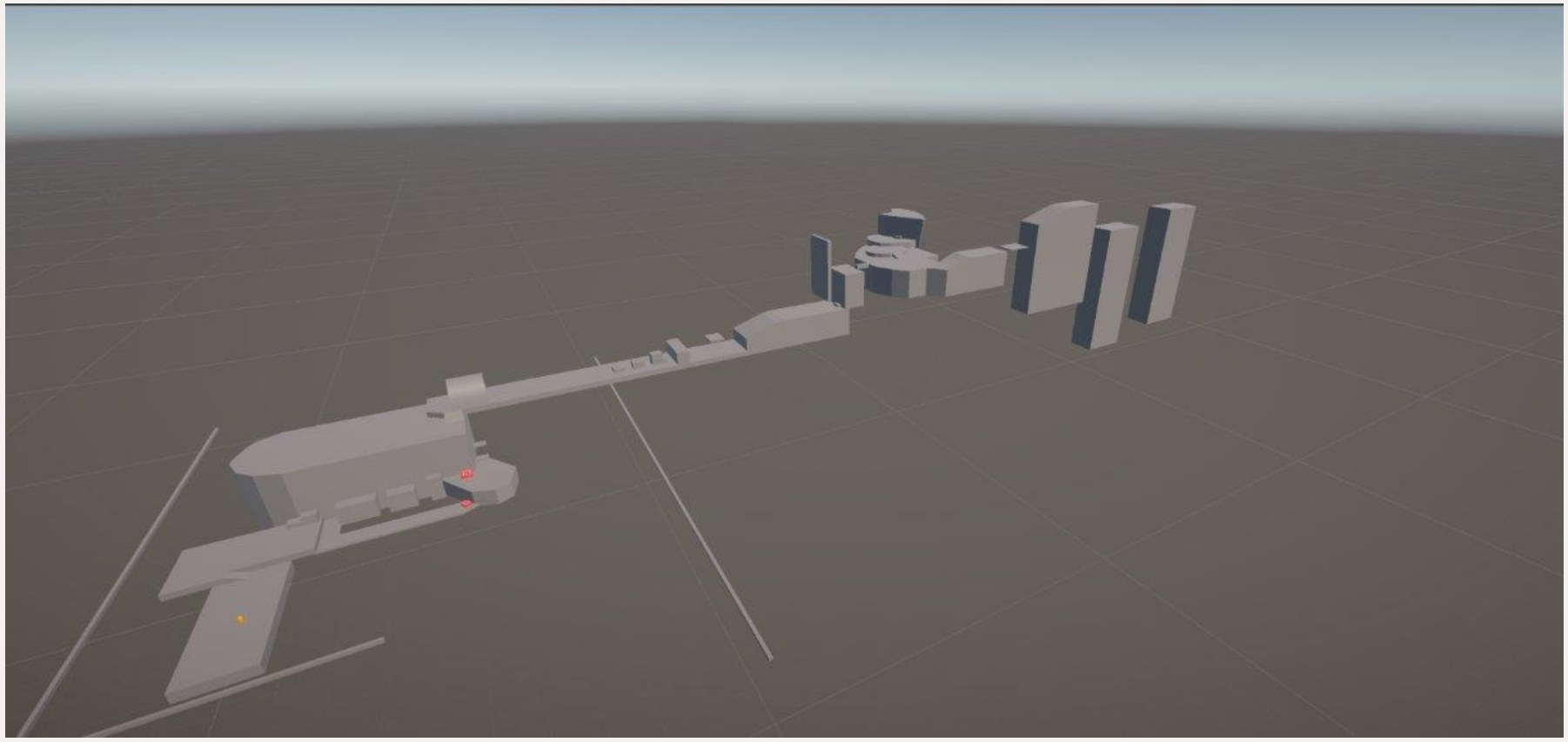




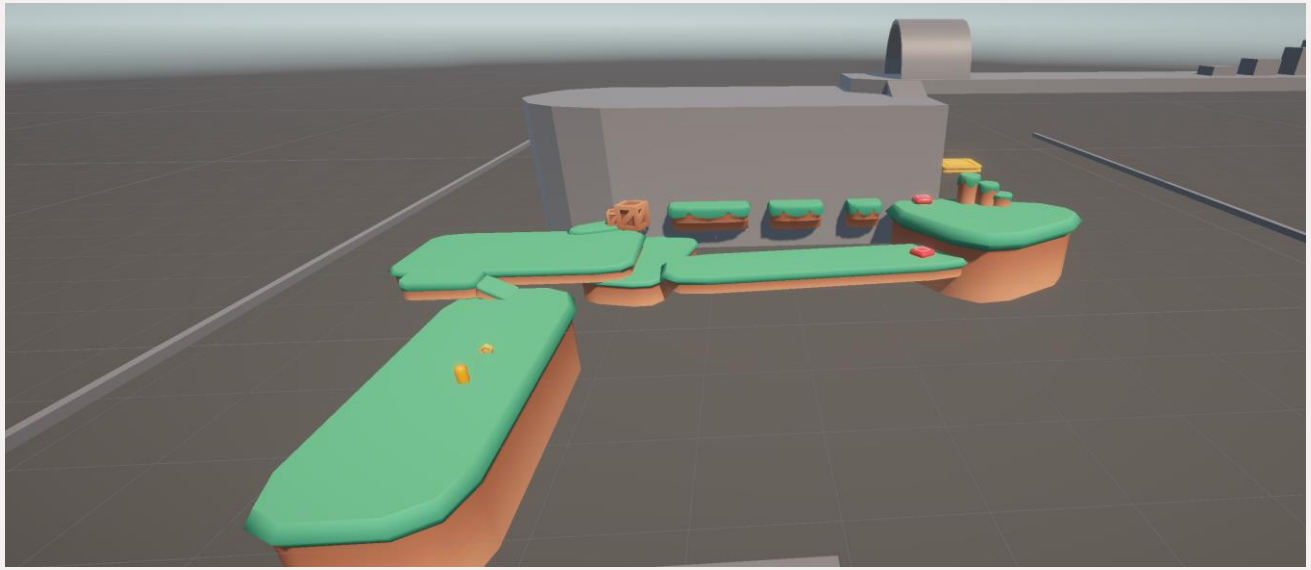
Level Design Evolution 5/7

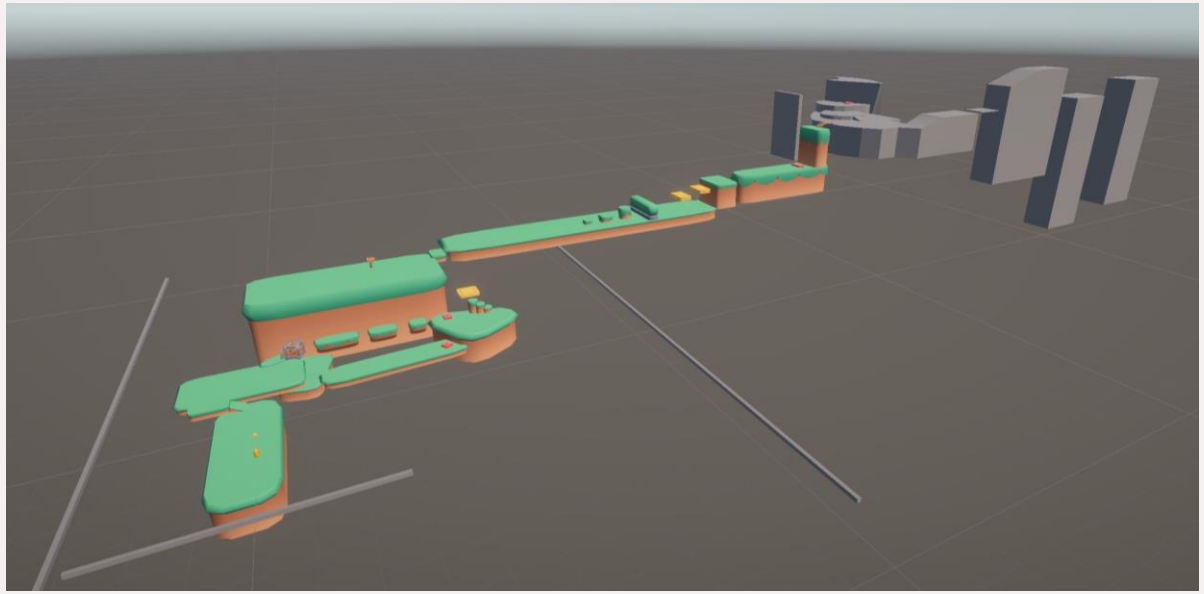


Level Design Evolution: Final Blockout

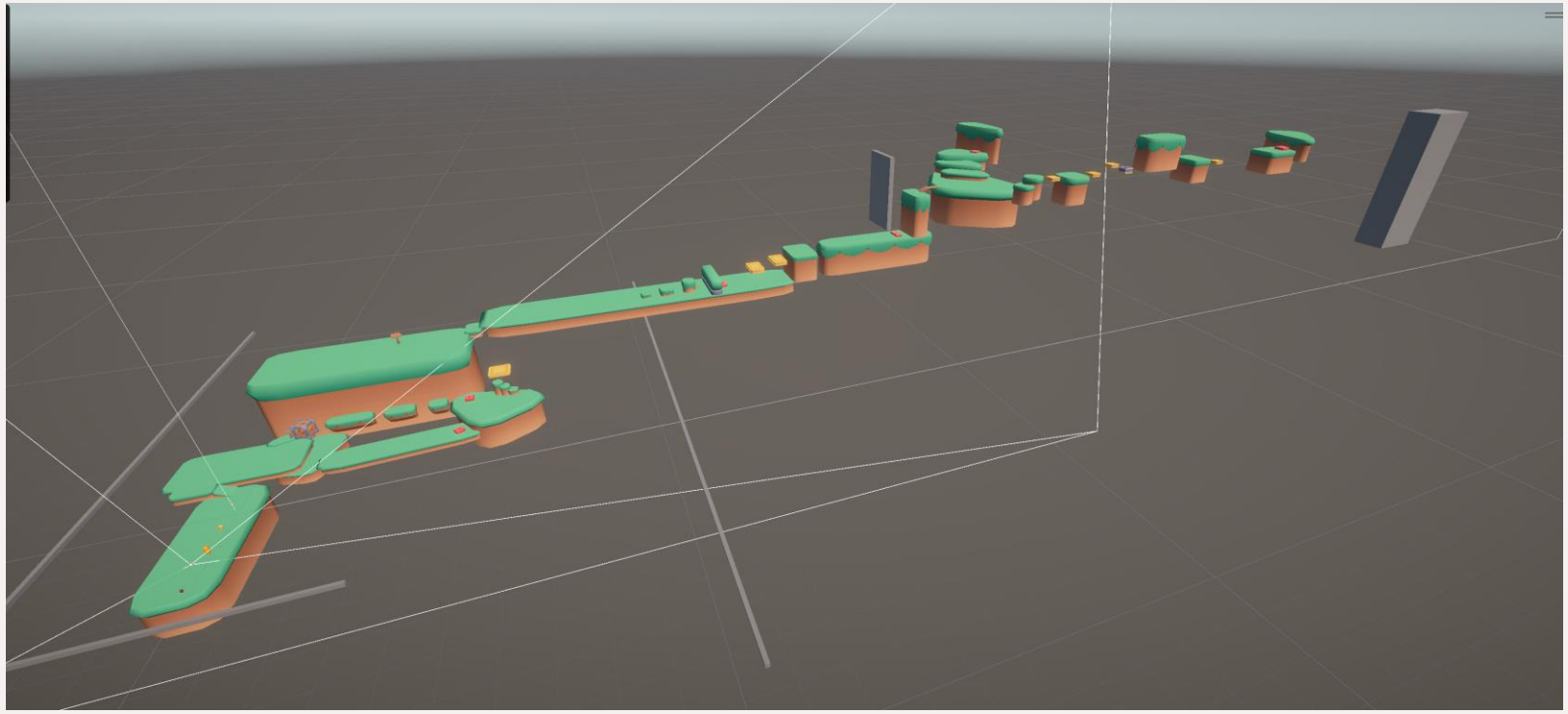


Level Design Evolution 6/7

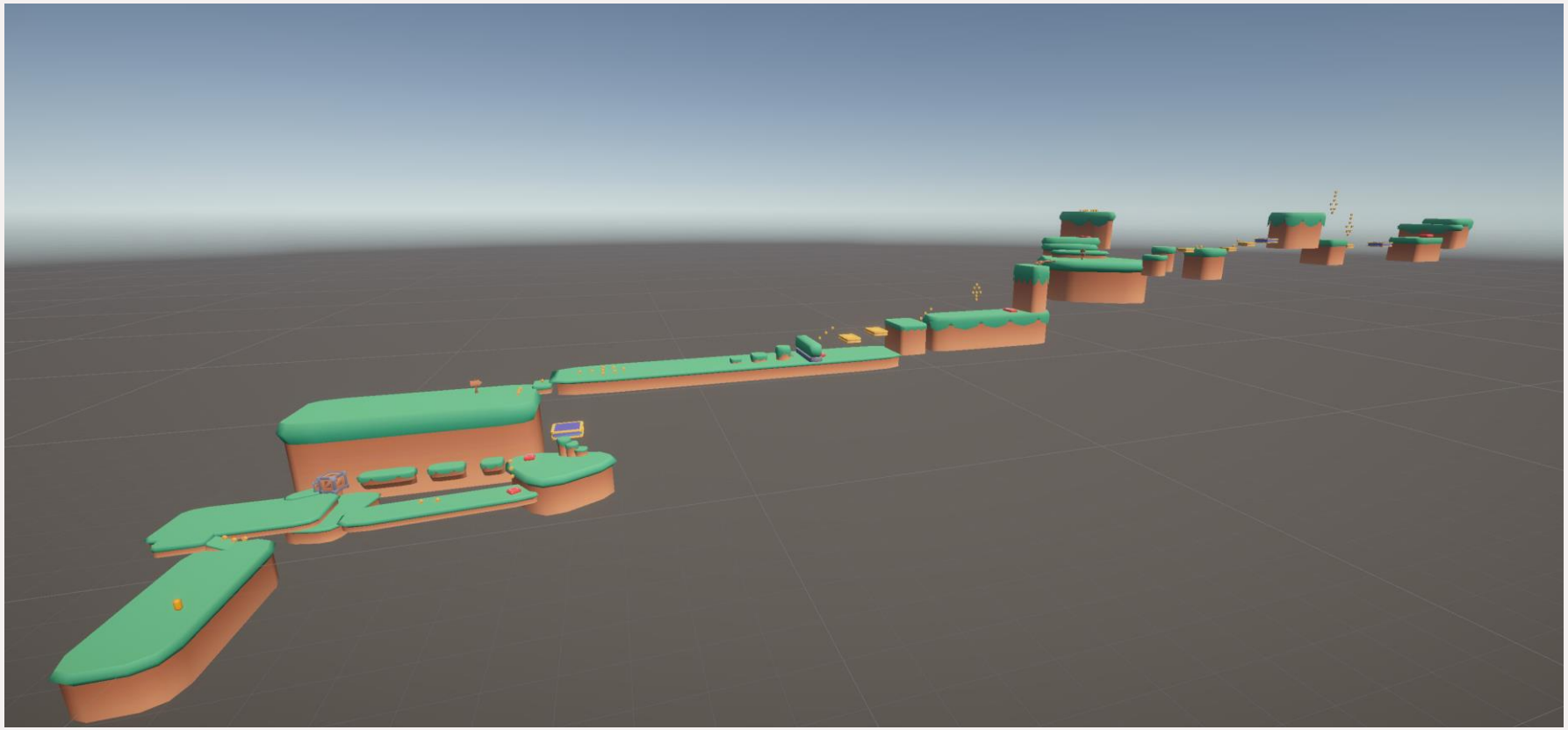




Level Design Evolution 7/7



Level Design Evolution: Final Level



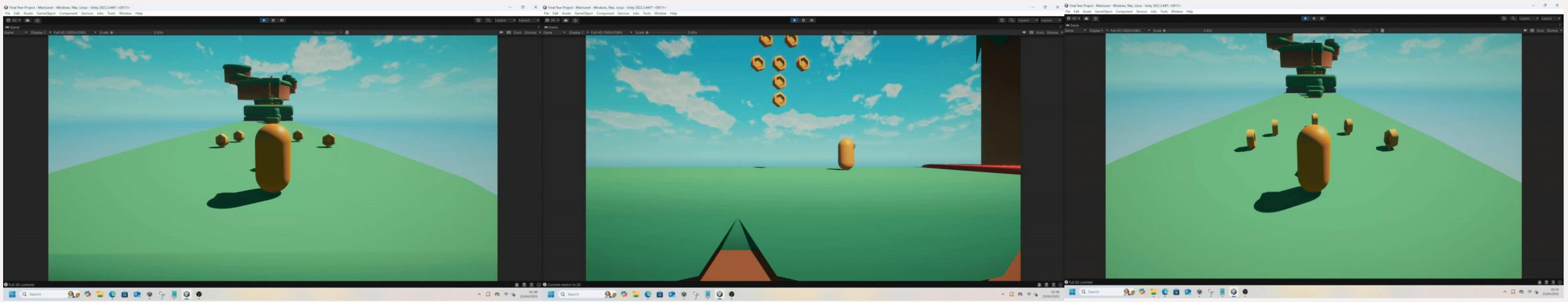
Implementation: Transitions

- Three different transitions were implemented:

- **Smooth Camera transition:** is as simple as changing the camera priority via code
- **Black Screen transition:** The animation itself was created using Unity's animation, which is then triggered via code.
- **Countdown transition:** Disables player input and re-enables it after an on-screen "3..2..1" countdown

- These transitions open the gate for an A/B/C test

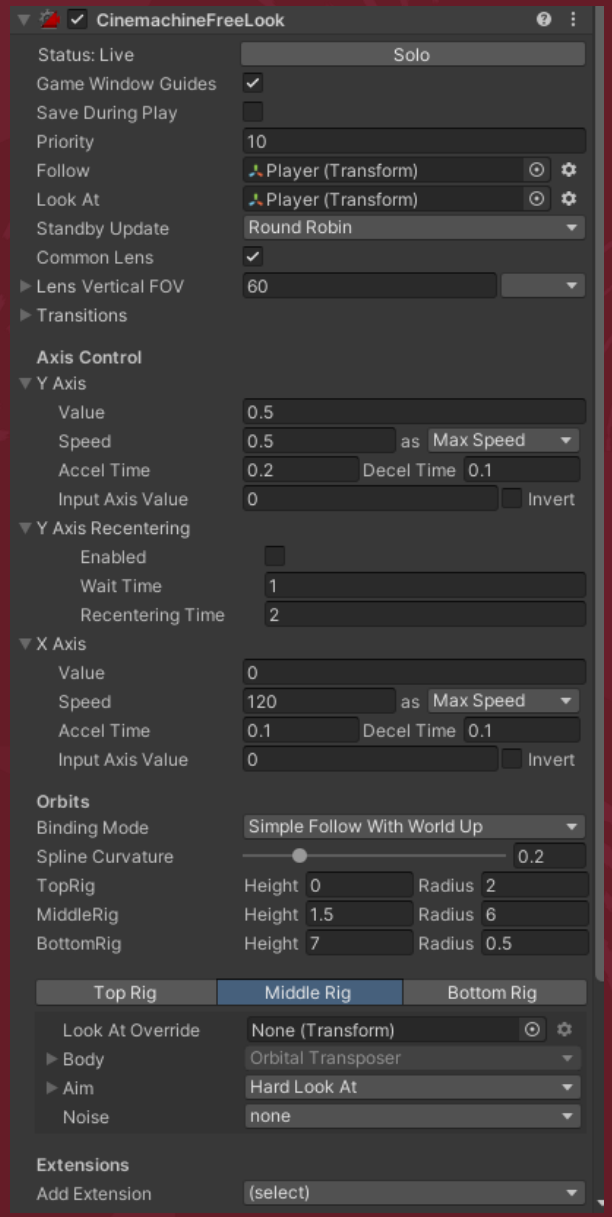
Implementation: Transitions Showcase



Video 3: Transition 1 (Smooth Camera)

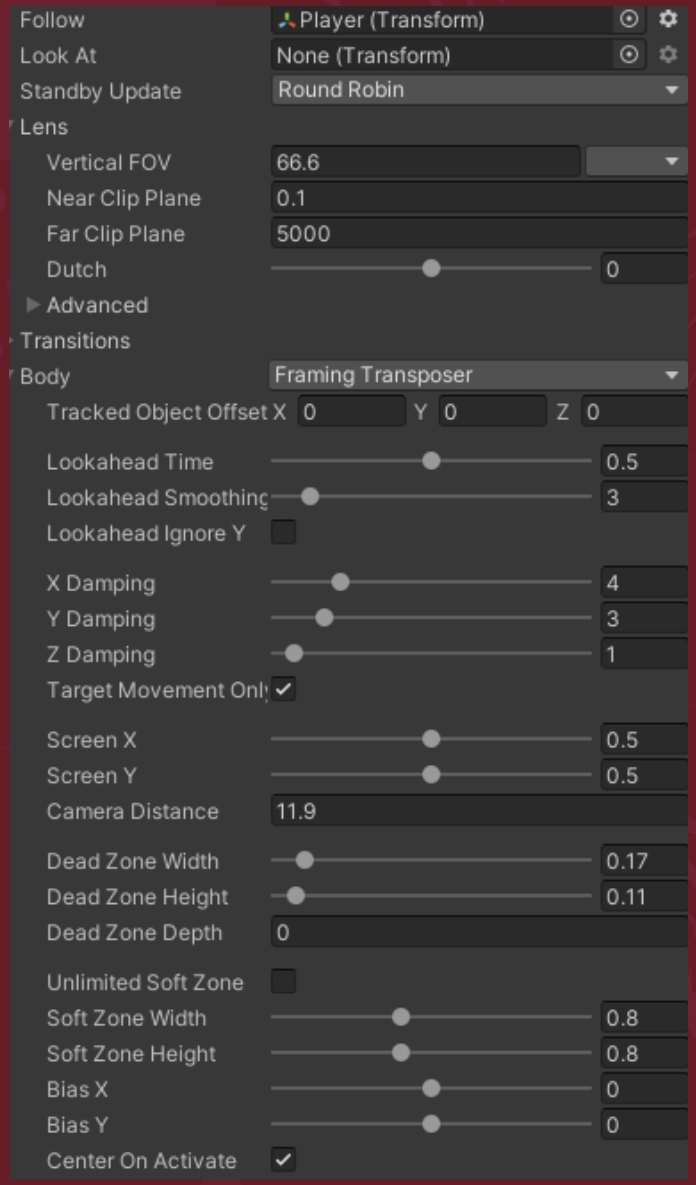
Video 4: Transition 2 (Black Screen)

Video 5: Transition 3 (Countdown)



Implementation: Camera Settings (3D)

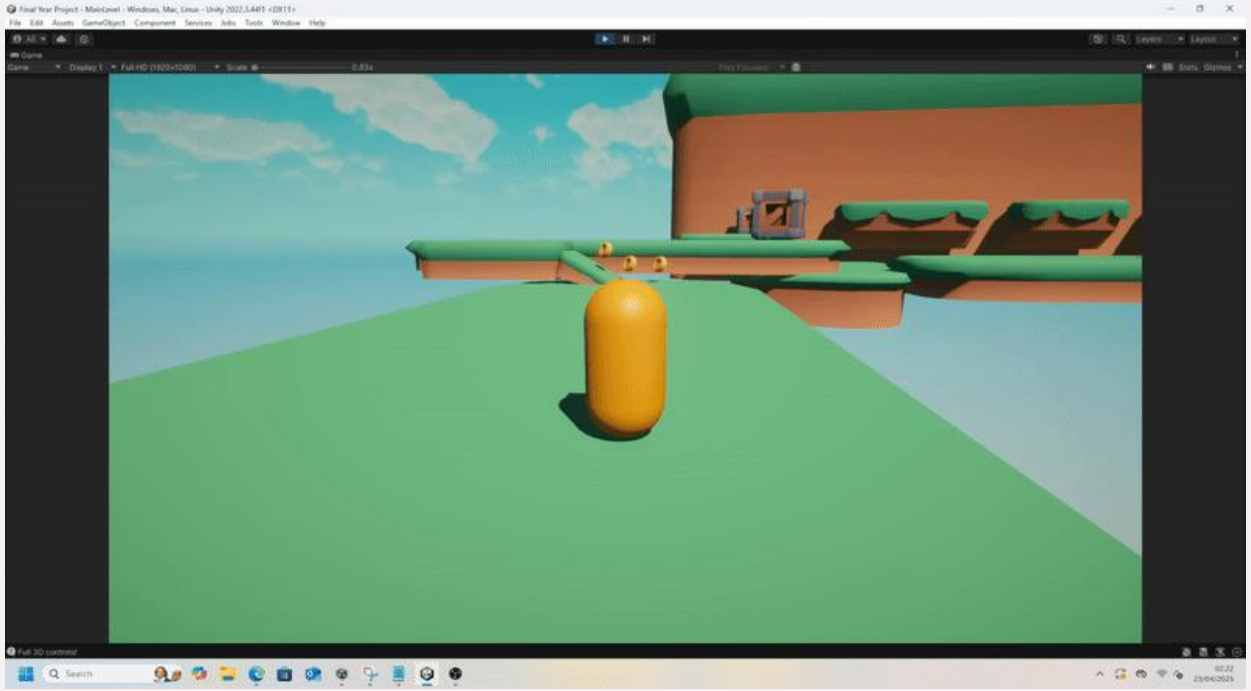
- A few settings were tweaked, such as:
- **X/Y Axis Speed:** Controls the camera's speed and stability.
- **Invert Box**: If left checked, camera controls will be inverted.
- **Rigs:** Control the X/Y orbital position of the camera.



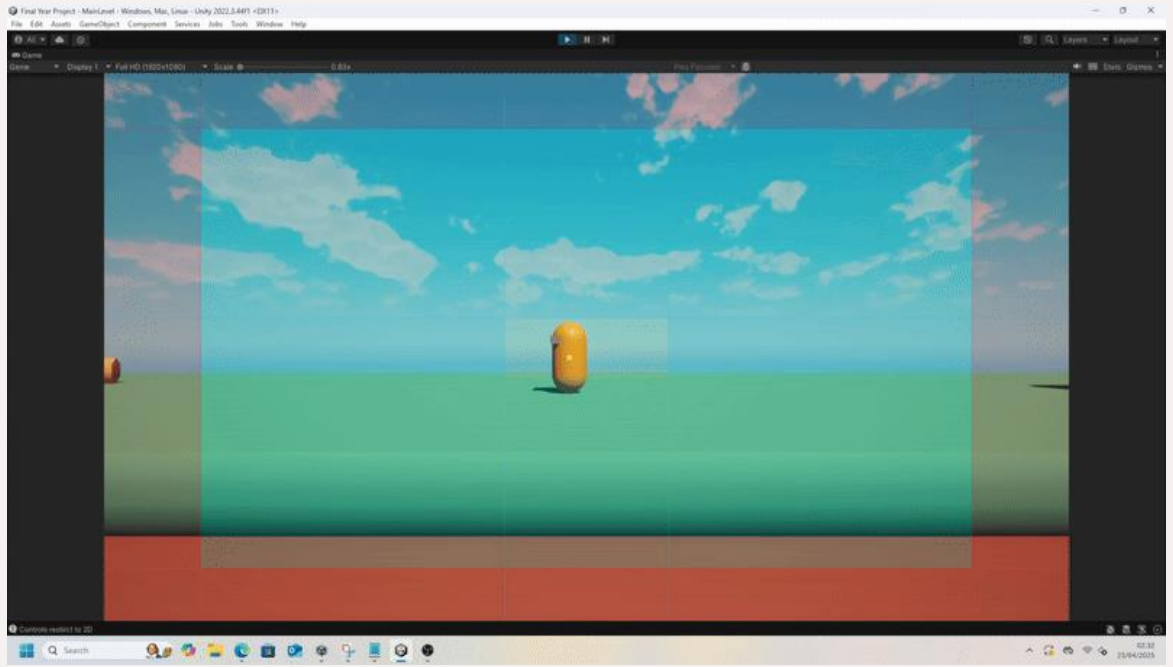
Implementation: Camera Settings (2D)

- Various settings were tweaked, such as:
- **Framing Transposer (body):** Moves the camera in a fixed screen-space relationship to the player.
- **Lookahead Time:** Adjusts the offset of the camera from the player.
- **Damping:** The responsiveness in maintaining the offset in the X/Y.
- **Dead Zone:** Adjusts the size of the "camera window."

Implementation: Camera Demo

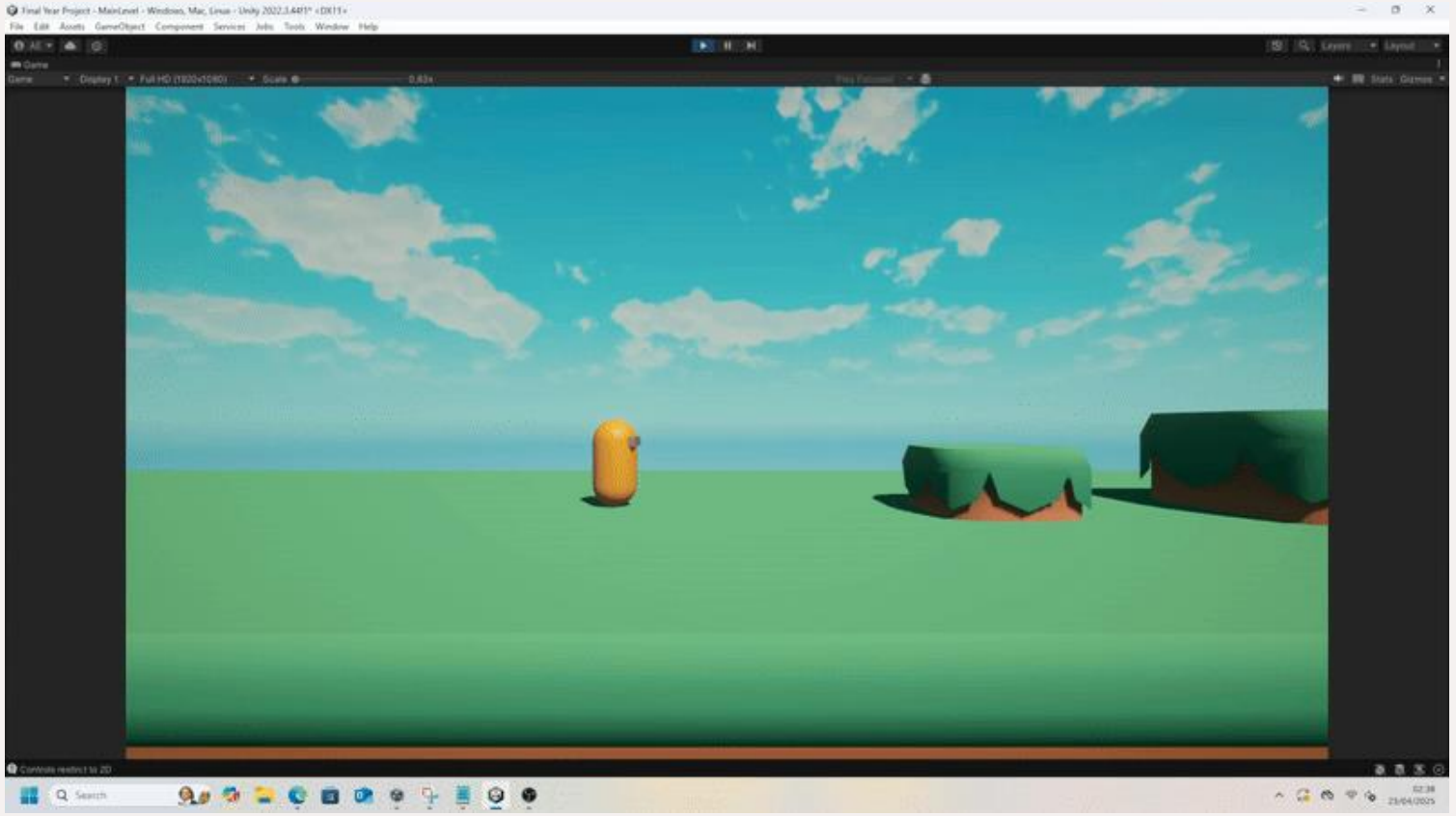


Video 6: 3D Camera



Video 7: 2D Camera

Implementation: Miscellaneous (Coyote time)



Video 8: Demonstrating Coyote time in game

Evaluation

- A mixed-method approach was used, which included both quantitative and qualitative data.

- **Quantitative data**: GUESS-18 questionnaire, and results from A/B/C testing.
- **Qualitative data**: Post game interview involving participants answering the following two questions:

1) Which transition did you prefer

2) How did you find the level

- Participants were tasked to play the level three times and complete the questionnaire after each run. After their final run, they were asked the two questions above.

Results: Introduction

Data was collected across two user testing sessions:

Session 1:

- Held on the 12th of March 2025
- **Total participants**: Eight

Session 2:

- Hosted by the Games Development Society
- Held on the 19th of March 2025
- **Additional participants**: Five

Results: General Data

- The GUESS-18 questionnaire assess nine aspects of player experience, rated using a seven-point Likert scale (e., 1 = Strongly disagree, 7 = Strongly Agree)

- Each subscale has two questions, which can be averaged together to obtain a subscale score. Additionally, a composite score can be obtained by summing up all subscale score.

- Results were quite positive with the Personal Gratification subscale averaging a score of 6.46, followed by the Usability/Playability and Enjoyment scales.

Results: General Data Chart

	Subscale Score	Composite Score
Usability / Playability	5.88	45.91
Narratives	4.42	
Play Engrossment	5.67	
Enjoyment	5.87	
Creative Freedom	5.06	
Audio Aesthetics	3.96	
Personal Gratification	6.46	
Social Connectivity	3.71	
Visual Aesthetics	4.87	

Figure 9: Table showing the subscale and composite score

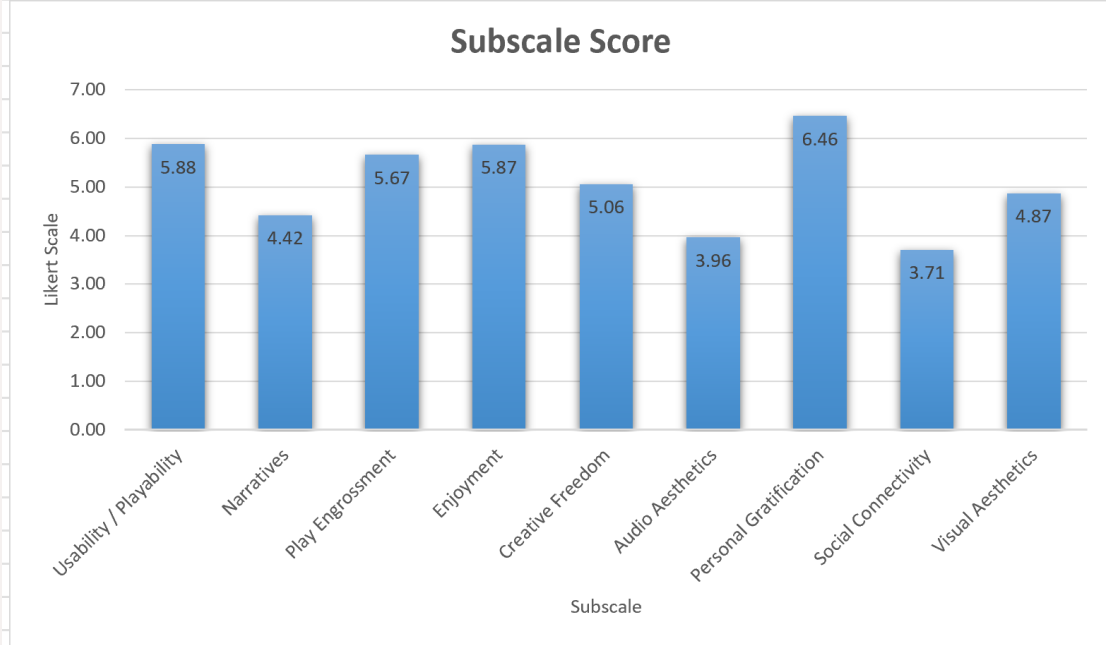


Figure 10: Bar chart visually comparing each subscale

Results: Question Specific Data

Out of the full GUESS-18 question set, two questions were selected based on their relevance to player engrossment:

- **QU5) I feel detached from the outside world while playing the game.**
- **QU6) : I do not care to check events that are happening in the real world during the game.**

- The results from these questions were positive as well, highlighting moderate to high levels of detachment from the outside world and engrossment. Suggesting the level successfully engaged participants.

Results: GUESS-18 Data

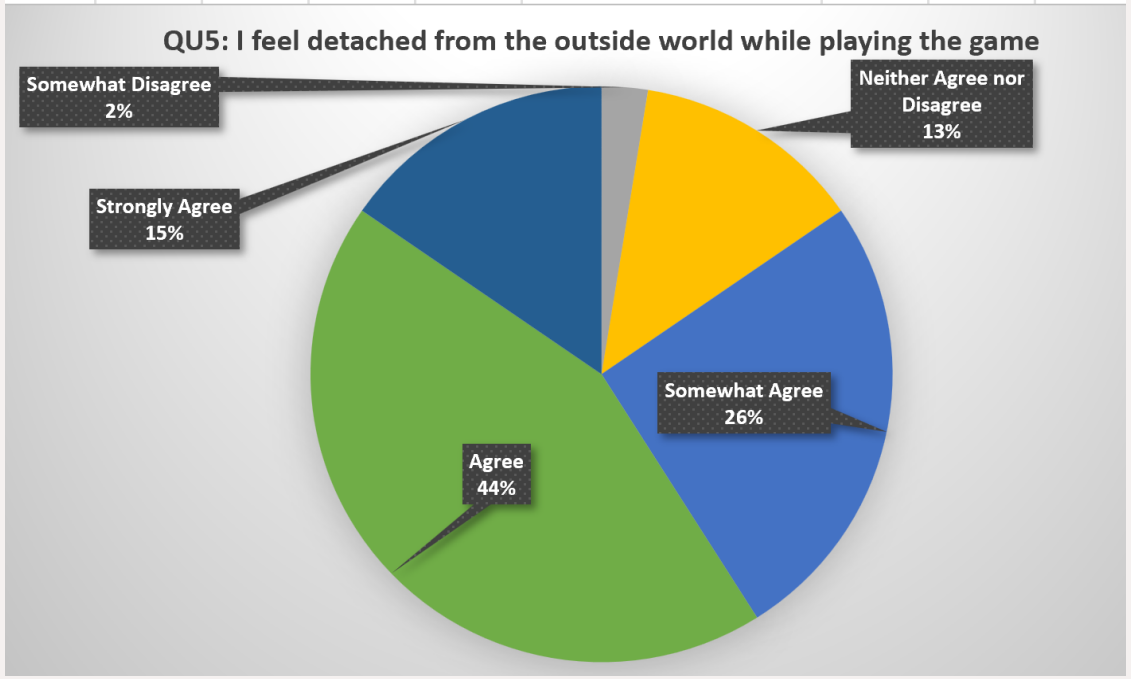


Figure 11: Results from Question 5

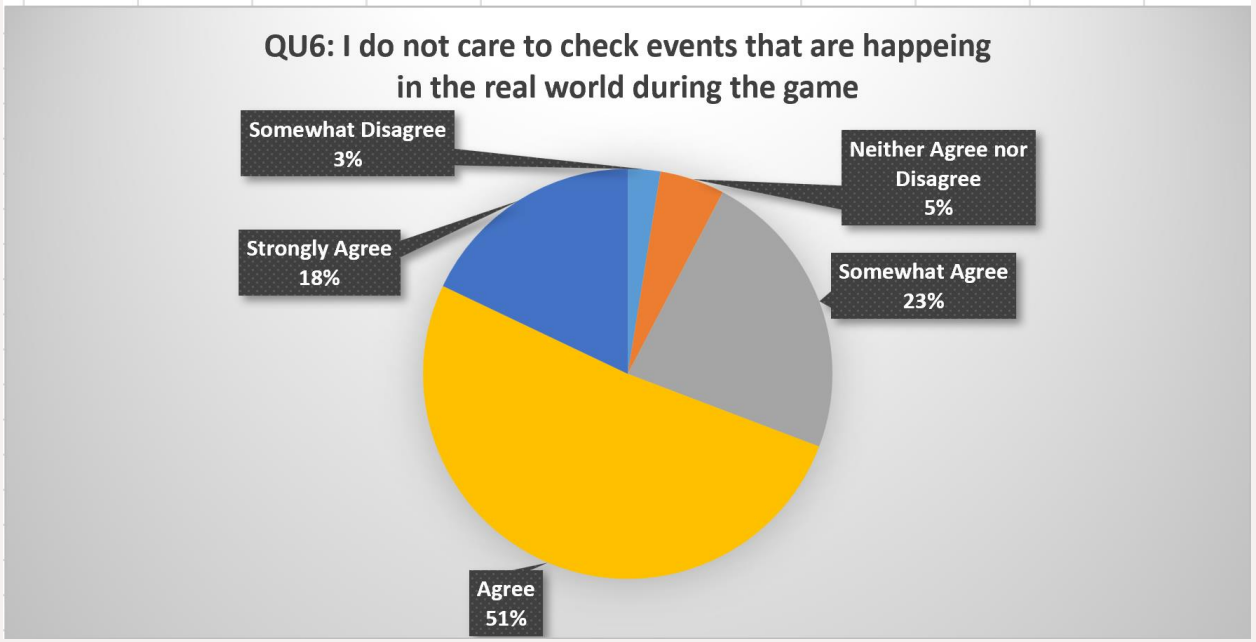


Figure 12: Results from Question 6

Results: Transition Data

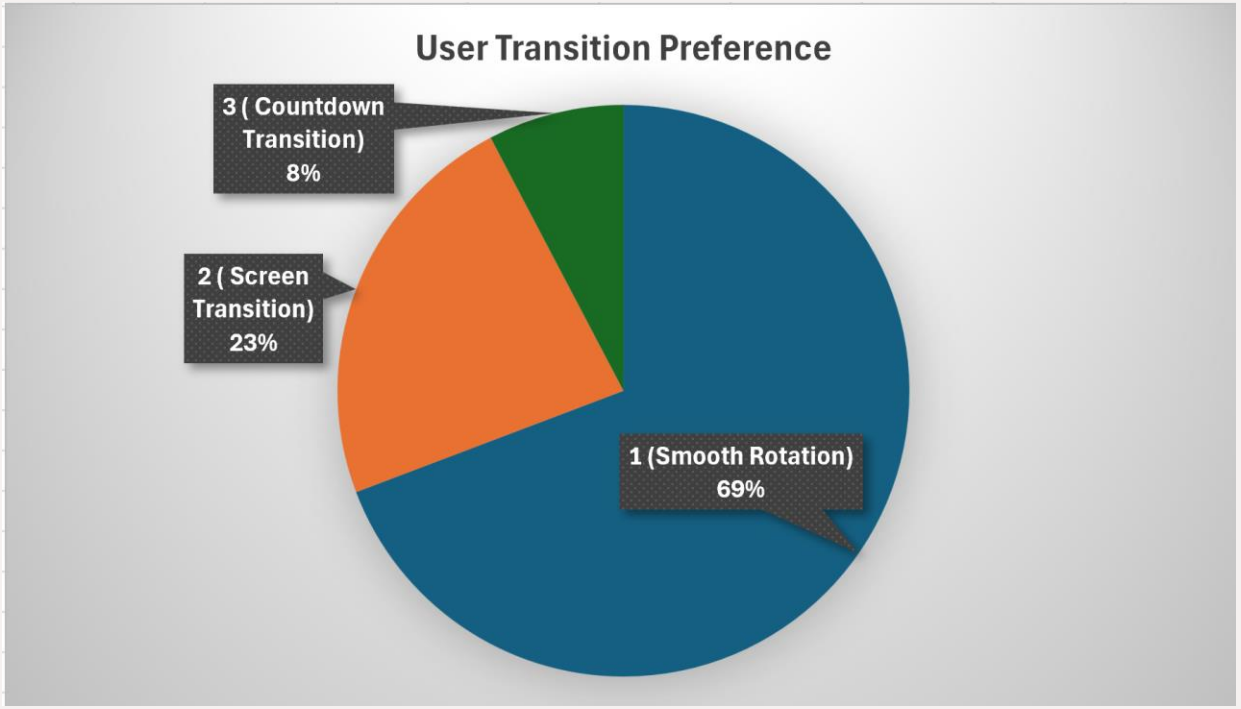


Figure 13: Data on participant transition preference

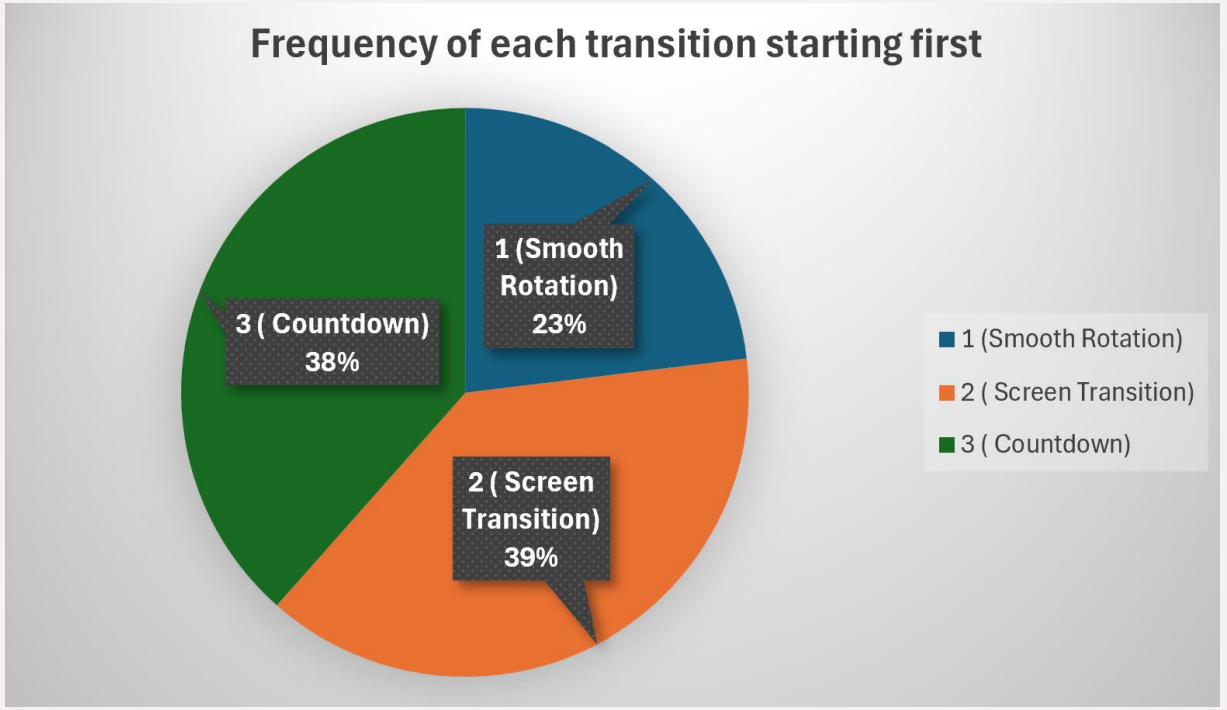


Figure 14: Frequency of the transition starting first

Results: Interviews

2) How did you find the level

- 2D - Camera need to he zoomed out due to lack of upcoming warning
- Moving Platforms too slow
- Z-Axis Platform

1/2

- Sprint problem
- Level good - better use of collectibles
- level is fun - good use for gudience
- Quicker black fade transition
- Level design nice!
- Nice level- side collision
- Fun level
- 2D camera change
- Good different pathways
- Good interaction
- Gravity might need tweaking
- Level good - camera
- Collisions need fixing
- 2nd transition best for uninterrupted flow
- Speedruning 113
- speed-up potentially and good branching option
- bugs

Results: Interviews

- Participants generally responded positively to the level, describing it as a ‘fun’, praising its branching options, interaction, and effective use of collectibles for guidance. However, a few participants noted a few issues.

- When asked about their transition preference, majority preferred the smooth transition for being non-disruptive to gameplay.

Discussion / Reflection

- Despite the level's simplicity, it was well received by participants for its design and was successful in maintaining players throughout

- The biggest challenge was planning and implementing the level design. Sketching the layout for both sections on paper was overwhelming and determining the level pacing and ideal length was difficult.

- To overcome these challenges, it was decided the level structure would include three 3D sections and two 2D sections, with each section being short to keep participants engaged.

- Further research could be done into the long-term effects of dimensional shifts on player engagement, flow, and level design, as well as a more robust testing strategy.

Conclusion

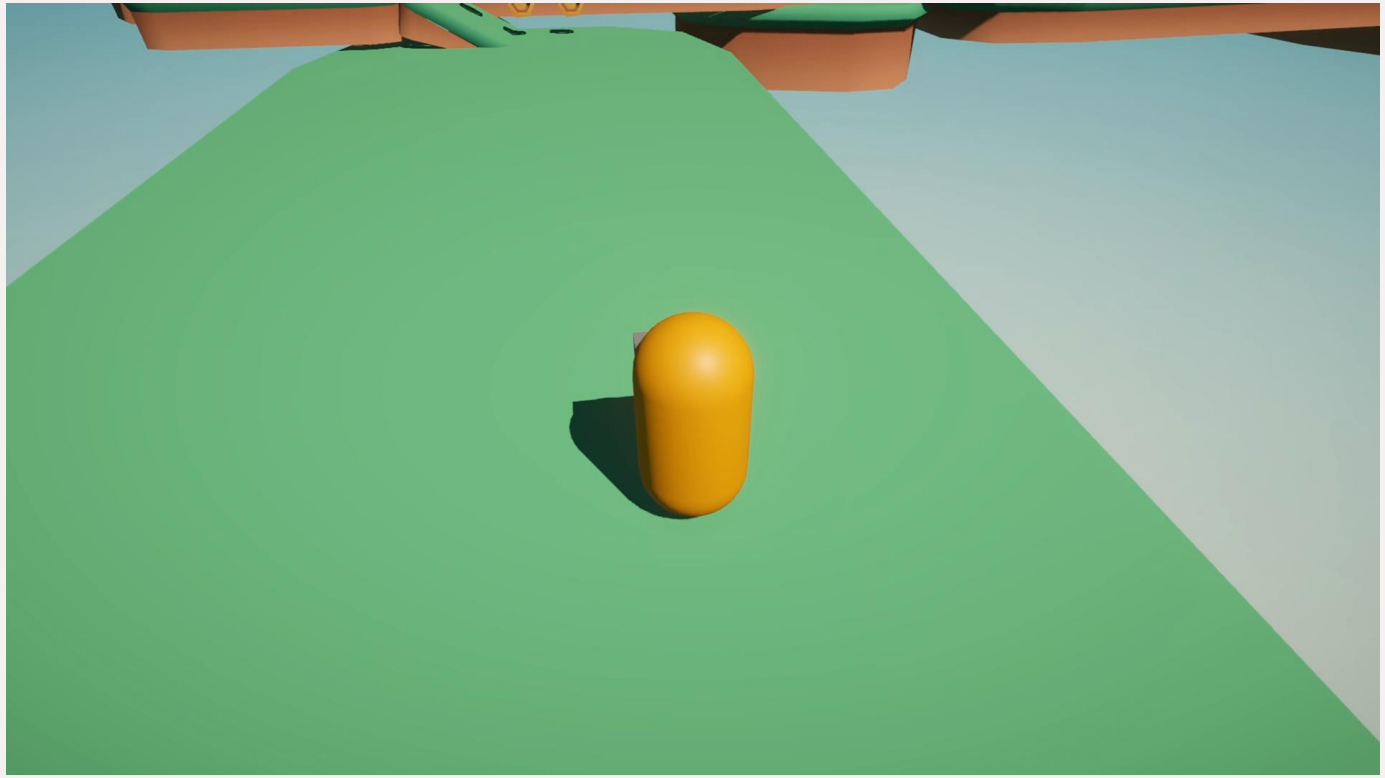
- This project set out to explore the transitions between 3D and 2D, and how those shifts affect level design, player engagement, and flow.

- A short playable level was developed incorporating both 3D and 2D sections to evaluate which transition participants preferred and found least disruptive.

- Results from the testing sessions indicate that is possible to maintain player engagement when transitioning between 3D and 2D.

- While this study provides valuable insights, further research is needed to explore this concept in more depth.

Project Showcase



https://youtu.be/bJ6Vh48gdqM?si=52VFGeXSHdQNF2-u

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Thank you for listening!
Any questions?