

Game Design Document

Flip the Hue
Hue Crew

Team Members

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Important References

GitHub Repository for GitHub Pages Host	https://tianlanyang.github.io/526Group16Project1/
Unity Project GitHub Repository	https://github.com/CSCI-526/csci526-fall24-friday-main-hue-crew
Playable Alpha Progress Check Build	https://tianlanyang.github.io/526Group16Project1/
Playable Alpha Build	https://csci-526.github.io/csci526-fall24-friday-main-hue-crew/AlphaBuild/
Alpha Gameplay Video	https://youtu.be/6ZNzu5Ysiz8
Alpha Survey	https://docs.google.com/forms/d/e/1FAIpQLSd_QedBKRyPsIIPY236rujHGYMRfCHdS5RWYfQXAgHZgekMAA/viewform
Playable Beta Progress Check Build	https://csci-526.github.io/csci526-fall24-friday-main-hue-crew/Beta_Progress_Build/
Playable Beta Build	https://csci-526.github.io/csci526-fall24-friday-main-hue-crew/Beta_Build/
Beta Gameplay Video	https://youtu.be/KluY3i441_Y
Beta Survey	https://docs.google.com/forms/d/1zvS60Jn0DBdR82S8ZxnoClxggkBzZtGVu56ckvm7-m4/edit
Playable Gold Progress Check Build	https://csci-526.github.io/csci526-fall24-friday-main-hue-crew/Gold_Test/
Playable Gold Build	https://csci-526.github.io/csci526-fall24-friday-main-hue-crew/Gold_Build/
Gold Gameplay Video	https://www.youtube.com/watch?v=iBc_xdPWosU

Game Introduction

Logline

A combination of 2D-platformer and Puzzle game with a color-flipping mechanic where the player can toggle between black and white backgrounds to navigate through obstacles, while avoiding traps, to reach the destination.

Player Goals / Win Conditions

Reach the destination

Dodge the traps

Clear all levels

Game Description

Flip the Hue is a 2D platformer-puzzle where players navigate levels by dynamically switching between black and white backgrounds to manipulate obstacles and reach the destination. In this game, only obstacles that contrast with the current background color are visible and passable, while obstacles of the same color blend into the background and become impassable. Players must strategically toggle the background color to create accessible paths, avoid traps and progress through levels. The game's levels increase in difficulty, introducing more complex platform arrangements and traps that require precise timing and quick thinking.

The core challenge is mastering the background-switching mechanic, as the players need to continuously assess their surroundings and choose the right moments to change the background. Traps add an extra layer of difficulty, sending players back to start if they collide with them. Each level has a unique layout and progressively increasing complexity. This game encourages players to think creatively and adapt their strategies to overcome obstacles and complete the game.

Controls

Movement: A,D, Left Arrow (<-), Right Arrow (->)

Jump: Space

Background switch: C, J

Dash: V, K

Detailed Design

Game Mechanics (How to Play)

Movement Mechanic: Players control movement using the keyboard with either 'A' and 'D' or the left and right arrow keys for left and right movement, the 'Space' key for jumping and the 'V' or 'K' key for dashing. The character's movement is designed to be responsive, including slight acceleration to create a sense of momentum and help in navigating platforms and avoiding traps.

Background Switching Mechanics: The core mechanic involves switching between black and white backgrounds using the 'C' key or 'J' key. When the background is white, black obstacles are visible and impassable; when the background is black, white obstacles are visible and impassable. On a white background, white obstacles are not visible and passable; on a black background, black obstacles are not visible and passable. Players must switch backgrounds strategically to open pathways and avoid dangers.

Trap Mechanic: Traps are additional challenges that are placed near critical obstacles or at the end of platform sequences, bumping into which will make the player go back to the last activated checkpoint of the level. White traps are visible on black background and black traps are visible on white backgrounds. Players must plan background switches carefully.

Game Mechanic Research

<Game mechanic 1 by Team Member: Tianlan Yang>

Game Title	Super Mario Galaxy 2
Mechanic/System	Gravity-based platforming
Interest	In our game, we also need to apply gravity related mechanics to the character(ball) for the player to have better experience with

	the real object. Also, the gravity-based platform can help players to pass some of the specific checkpoints.
Interaction with other mechanics	The gravity mechanic works together with these launch systems, allowing for seamless transitions between different gravity zones. Players must adapt to changing gravitational pulls mid-flight. These stars are used to propel Mario between planets and across large distances.
Utility	We can allow the player to control the levels of gravity in different levels, especially in sections where we want the player to explore multiple paths or dimensions in a level.

<Game mechanic 2 by Team Member: Siddhi Singh>

Game Title	Color Switch
Mechanic/System	Color based navigation
Interest	Color based navigation adds a unique challenge and depth to our game by making the player's ability to progress dependent on correctly timed interactions with the environment. In our game color switching mechanic requires players to be continuously aware of their surroundings and react quickly to the changes, hence increasing engagement and excitement.
Interaction with other mechanics	The color based navigation interacts with other game elements like movement and speed. Players must carefully time their jumps and navigate through the rotating or moving obstacles which can vary in speed and pattern.
Utility	We can use color based navigation to determine which obstacles are accessible. It adds a dynamic element to the gameplay where the environment itself is continuously changing, providing a twist on traditional platform games.

<Game mechanic 3 by Team Member: Riya Ranjan>>

Game Title	Invert
Mechanic/System	Tile-flipping mechanic
Interest	In our game, we also want to incorporate a mechanism that allows players to manipulate their environment strategically,

	similar to the tile-flipping in Invert. This will enhance the puzzle-solving aspect and encourage players to think critically about their moves.
Interaction with other mechanics	In Invert, flipping a tile affects adjacent tiles, creating a ripple effect that adds complexity to puzzle-solving. This interaction introduces a layered challenge, forcing players to think multiple steps ahead. In our game, the background switching mechanic can interact similarly with other elements, such as traps or platforms, which are either activated or deactivated based on the background color.
Utility	We can implement a similar mechanic that allows players to influence multiple environmental elements by switching backgrounds. This could create more challenging puzzles, where players must manage not only their path but also the effects on traps and obstacles in the level.

<Game mechanic 4 by Team Member: Shih-Ju Hsu>

Game Title	Celest
Mechanic/System	Power-Ups
Interest	Other than moving and jumping, players also can move their character to climb the walls and dash in the air, allowing them to dodge obstacles and navigate difficult terrain.
Interaction with other mechanics	It can interact with gravity to allow users to do strategic movements to dodge obstacles or pass traps. For example, they can defy gravity by climbing on walls or dashing for certain areas.
Utility	In the next few levels, we can increase the difficulty by introducing more complex terrain. Players will need to enhance their flexibility and precision by moving or jumping more effectively to dodge obstacles and reach the destination.

<Game mechanic 5 by Team Member: Andre Lebecki>

Game Title	Titanfall 2
Mechanic/System	Level Swapping Enemies

Interest	While jumping, the player has to think about and envision 2 copies of the level in their head and what threats are in each to be able to avoid them.
Interaction with other mechanics	In Titanfall 2, in addition to the player platforming through the 2 copies of the level and swapping between them to access different platforms in each copy, the player must also fight through different enemies and avoid different traps in each copy of the level.
Utility	We can use this mechanic to add tension to the platforming and even add some light puzzle solving elements to the game. The fast paced nature of this switch adds a twist to the platforming in our game.

<Game mechanic 6 by Team Member: Khushi Naik>

Game Title	Light and Shadow
Mechanic/System	Background color-based obstacle manipulation
Interest	In our game <i>Flip the Hue</i> , the main idea is to switch between black and white backgrounds to make obstacles either appear or disappear. This gives the player a fun challenge where they have to carefully decide when to switch to open up paths or avoid getting stuck. It keeps the game interesting and makes you think a little more about your moves.
Interaction with other mechanics	In <i>Flip the Hue</i> , the background switching works smoothly with the movement and trap mechanics. You'll need to switch at the right time to reveal platforms or dodge traps, especially while jumping or moving quickly. It's all about perfect timing and staying alert to make it through each level.
Utility	We can make this mechanic even more exciting by adding levels where the background switches automatically or on a timer, so you have to react quickly. This would add more variety and make things even more challenging as the game progresses.

Matrices

Twist & Mechanics Matrix

Mechanics	Description	Interaction with Twist	Affected Genre Elements	Supports
<i>Color switching</i> (Core Mechanics)	This mechanic allows players to manipulate the environment dynamically and create paths to their destination. By switching between black and white, players control which obstacles are impassable and must time their switches to move and avoid being trapped.	Color switching interacts with the game's twist by determining which obstacles and traps are passable or active.	Platforming challenges, puzzle solving, Obstacle navigation	Obstacles crossing, trap avoidance, strategic planning, quick reflexes, careful timing
<i>Color-based Platform</i>	Platforms that are only visible and usable when the player flips to the corresponding background color. These platforms help players progress without killing them.	Background color flipping reveals platforms (stationary and moving platforms), adding depth to navigation and puzzle-solving.	Platforming, puzzle-solving, environment navigation	Path creation, strategic movement, trap avoidance
<i>Color Based Traps</i>	Certain areas are affected by black/white traps that activate based on the current background color.	Background switching affects trap activation, forcing players to toggle environments carefully.	Traps, puzzle elements, player safety	Increases the challenge, strategy, puzzle-solving

Mechanic Interaction Matrix

Subject / Object	Color Switching	Color Based Platforming	Color Based Traps
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Color Switching	-		
Color Based Platforming	Platforms become visible and active depending on background	-	
Color Based Traps	Traps become visible and active depending on background	-	-

Color Switch Challenge Matrix

Challenge	Location	Difficulty	Player Must Learn	Instructions	Required Skills
Basic color switch	Start of level 1	Easy	How to switch backgrounds to reveal paths.	Press [C or J]	Observation
Hidden obstacles	Halfway through level 1	Easy	That there could be hidden obstacles or paths if they switch colors	None	Observation, timing
Obstacles blocking path	End of level 1	Easy	To be aware of traps and switch colors if they are falling on traps	None	Precision, reaction speed
Displaced Walls	Start of level 2	Medium	That there are multiple ways to beat obstacles	None	Strategy, awareness
Large Walls	Halfway through level 2	Medium	To use the color swap mechanic to gain info about their environment	None	Awareness
Displace walls while platforming	Level 2 before the dash test at the end	Medium	That multiple paths and blocked off walls can be combined with platforming challenges	None	Timing, awareness

Disappearing Overhang	Level 3 before first checkpoint	Hard	Players must use the changing environment while platforming	None	Timing, awareness
Blocked off wall	Level 3 second checkpoint	Medium	Players should start platforming sections on a certain color	None	Observation
Spikey path	Near the end of level 3	Hard	There are ways to skip difficult sections by switching colors	None	Observation
Hidden path in spikes	Near the start of level 4	Very Hard	There are alternate ways to go through the level if you look carefully	None	Observation, Memory
Tetris shaped wall	Level 4 checkpoint 2	Very Hard	You can access easier paths by switching multiple times	None	Observation, intuition

Color Based Platforming Challenge Matrix

Challenge	Location	Difficulty	Player Must Learn	Instructions	Required Skills
Color switching stairs	Halfway Through Level 1	Easy - Medium	That you will have to jump and swap colors at the same time	Press [SPACE + C/J]	Timing, observation
Longer staircase	Beginning of Level 2	Easy	That you must chain multiple swap jumps together	None	Timing, precision
Color switch staircase with big wall	Halfway through Level 2	Medium	Color swap jumps can be combined with other obstacles	None	Timing, observation
Opposite direction staircases	Start of Level 3	Hard	Players have to jump in multiple directions and	None	Strategy, quick reflexes,

and overhang			solve platforming challenges in both colors		spatial awareness
Moving platforms	Halfway through Level 3	Hard	To platform with moving platforms that are different dependent on color	None	Awareness, memory, timing
Smaller platforms	In the moving spike platform section of Level 3	Hard	Players can avoid traps but have to deal with other difficulties	None	Strategy, precision
Overlayed platforming challenges	Start of level 4	Hard	Players can choose which challenge to overtake and have to know when they overlap	None	Strategy
Staircases with moving traps	Three quarters through Level 4	Hard	Keep track of their surroundings while climbing stairs in multiple colors and directions	None	Memory, Precision

Color Based Traps Challenge Matrix

Challenge	Location	Difficulty	Player Must Learn	Instructions	Required Skills
Basic trap	Start of Level 1	Easy	To jump to avoid traps	Press [SPACE]	Observation, platforming
White trap in a pit	Halfway through Level 1	Easy	Traps will sometimes only be in 1 color	None	Observation
Black traps after drop	End of Level 1	Easy	To swap colors to avoid traps	None	Timing, reaction speed

Dash tutorial	Halfway through Level 2	Easy	How to dash to avoid obstacles in cramped spaces	Press [V or K]	Observation
Dash test	End of Level 2	Medium	To dash multiple times in a row	None	Execution
Moving spike	Start of Level 3	Easy	Players have to be aware of moving traps	None	Timing
Up and down moving spikes	Midway through Level 3	Hard	Players have to be aware of timing to avoid the traps, and if they fail to be careful of traps near the bottom	None	Timing, Observation
Spikey floors	Start of Level 4	Hard	Certain parts of the environment are blocked off based on color	None	Memory, Precision
Spikey floating platform	Before dash challenge of Level 4	Hard	Players need to switch colors to make platforms accessible	None	Timing
Multiple moving spikes	Midway through Level 4	Very Hard	Players need to keep track of multiple moving tracks in different colors	None	Memory, precision, timing
Spikey dash challenge	End of Level 4	Hard	Players need to time their dashes to make long jumps	None	Precision

Reference:  [Example Matrices](#)

Tutorialization implementation for Mechanics

Description:

1. Intro Scene:

- The game begins with a quick scene introducing obstacles and traps. This sets expectations and prepares players for the challenges ahead.

2. Level 1:

○ Basic Controls:

- Arrow keys are introduced immediately to teach players how to move forward and backwards. Instructions like “Press [C] or [J] to toggle the background” guide players to reveal hidden paths, traps and platforms.

○ Jumping and Traps:

- Players encounter color-based traps early on. They are taught to “Press [SPACE] to jump” and avoid traps to prevent restarting the level.

○ Jumping and Switching Combined:

- Early on, players face challenges where they must **jump over traps** (“Press [SPACE] to jump”) and combine it with background switching to progress.
- Players practice this by navigating simple platforms, learning timing and coordination for jump + switch actions.

3. Level 2:

○ Reinforcement of Core Mechanics:

- Jump + switch is reintroduced to ensure players remember the controls and improve their skills.
- The challenges in Level 2 require more precision and strategy, combining jump + switch with increasingly complex platforming tasks. For instance, players may need to toggle backgrounds mid-air to land on hidden platforms.
- Dash is introduced here: “Press [V] or [K] to dash across gaps.” Players learn to combine dashing with background switching to navigate distant platforms.

4. Level 3:

- **Timed Challenges:**
 - Mechanics such as timed background switches with moving platforms are introduced: “Wait for the right moment to switch to avoid falling down.”
 - Players face medium-difficulty tasks requiring timing, precision, and observation, slowly transitioning to harder challenges to test their understanding.

5. Level 4:

- **Mastery of mechanics**
 - All previous mechanics, jumping and dashing are combined into longer and more complex challenges.
 - Moving traps with varying speeds, dynamic platforms, and multi-step puzzles demand precise timing and strategic thinking.
 - Players must chain jumps, dashes, and switches seamlessly while navigating time-sensitive sections and layered obstacles, testing their ultimate skill and mastery.

6. Trap Interactions:

- If players hit a color-based trap, they see a quick message explaining the player will respawn at the last activated checkpoint of the level. This reinforces learning without harsh penalties.

7. Overall Learning Progression:

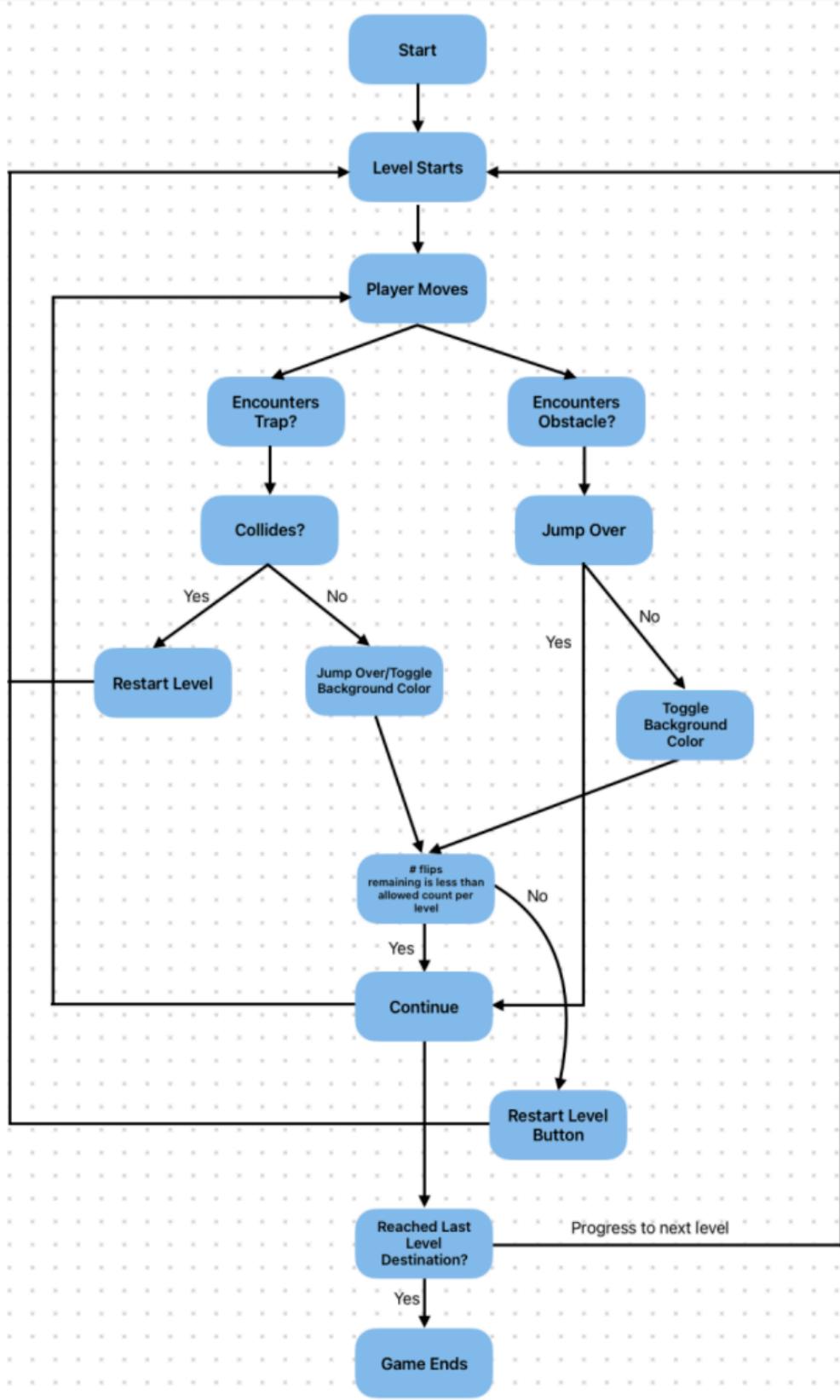
- Challenges transition smoothly from easy to hard, ensuring no sudden difficulty spikes.
- Players are required to demonstrate their understanding of core and supporting mechanics (e.g., color switching, platforming, traps) before progressing further.
- The prototype reflects the **Single Mechanic Challenge Matrix**, ensuring each mechanic is introduced, practiced, and tested in progressively more complex ways.
- Tutorials use minimal text, offering just enough guidance to encourage discovery while keeping the experience engaging.

By the end of Level 2, players will have mastered basic and advanced mechanics, ready for more complex combinations in later stages.

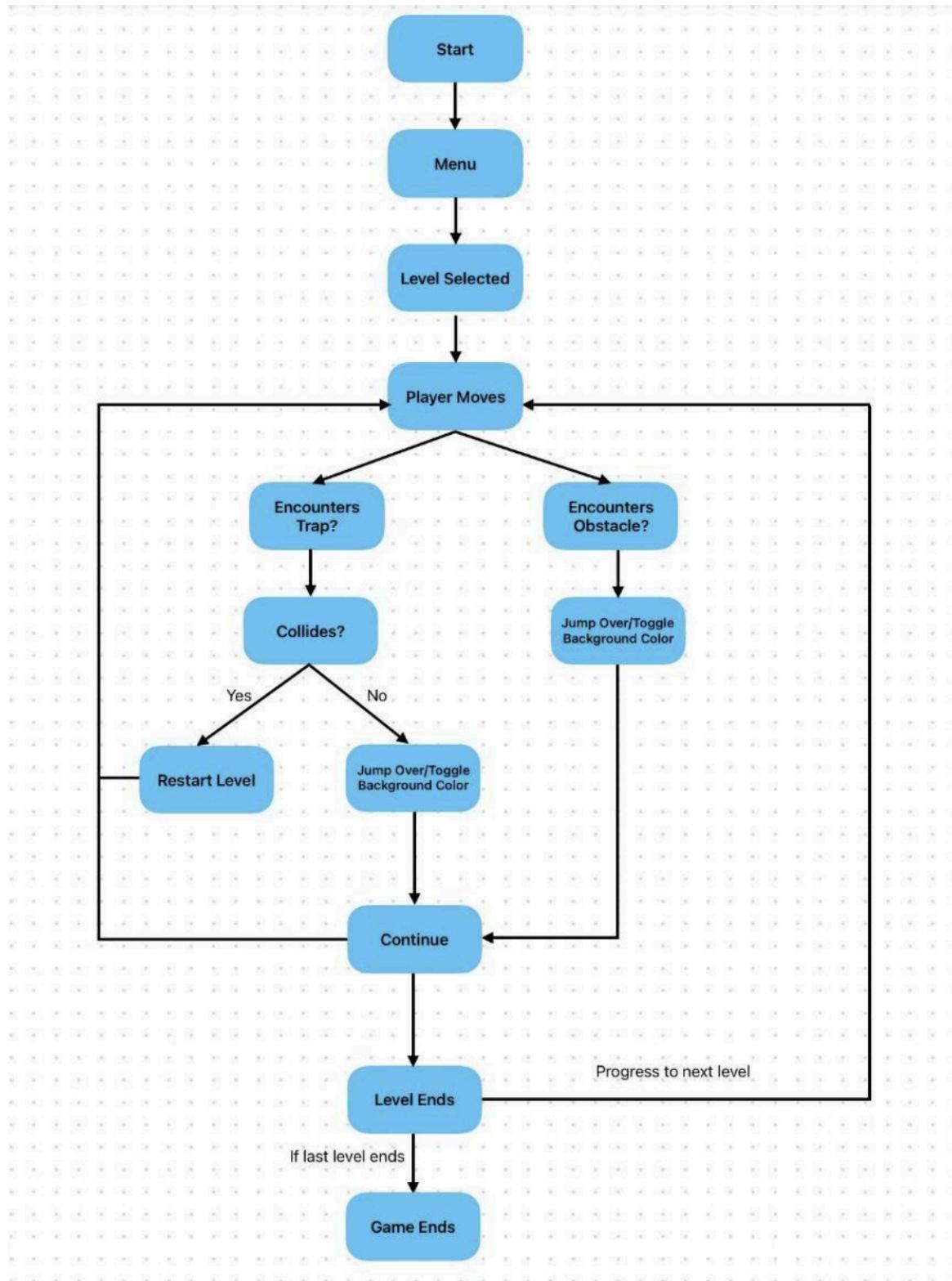
Sketches and Diagrams

Gameplay Loop

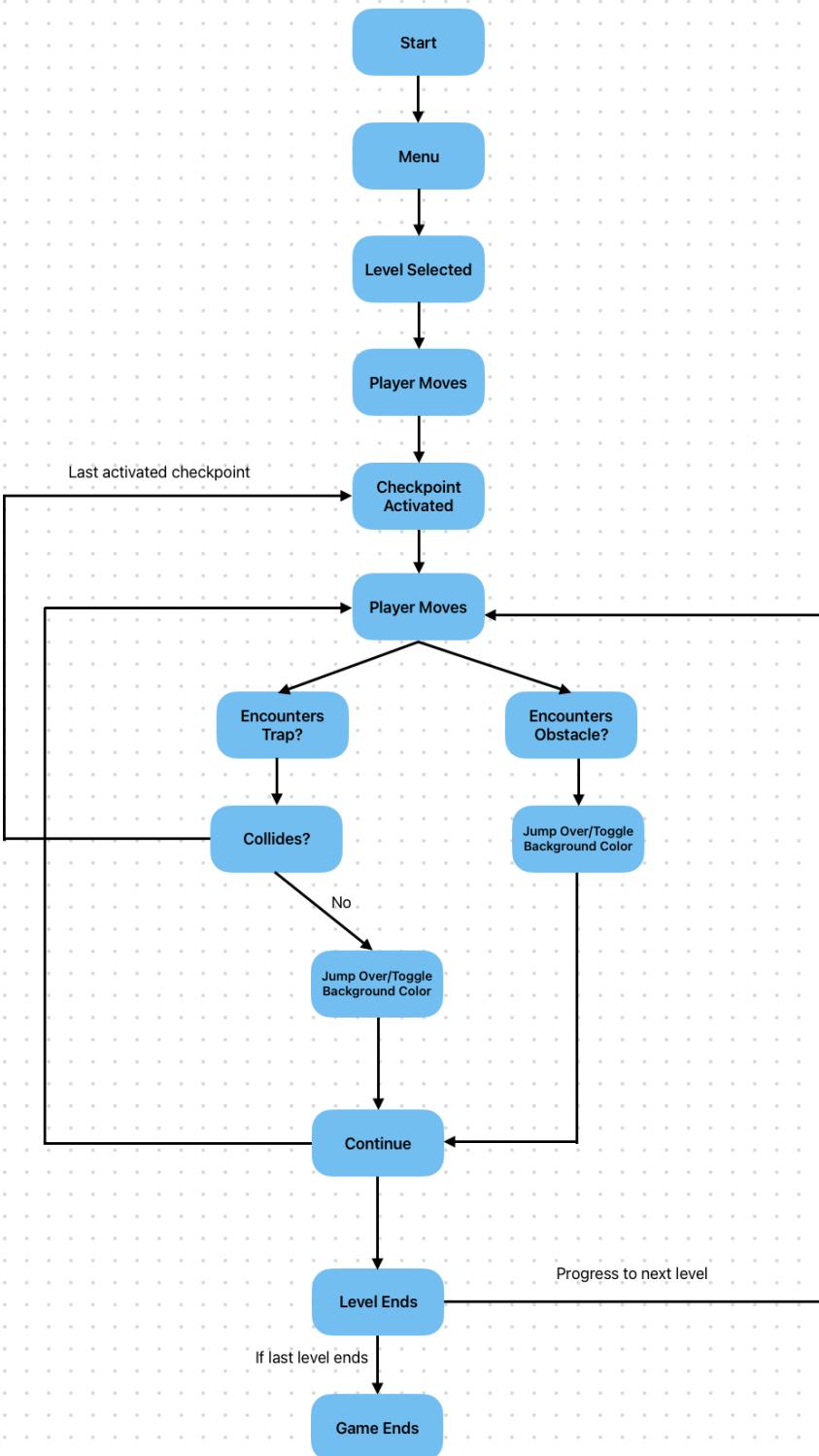
Alpha:



Beta:



Gold:



Level Designs

LEVEL 1:

Alpha:

Description: Tutorial level, introduces obstacles and teaches players to use A and D keys or Left Arrow (<-), Right Arrow (->) to move left and right. Introduces background switching mechanics using the 'C' key. Players use the 'SPACE' key to jump.



Use ARROW keys to move



Beta:

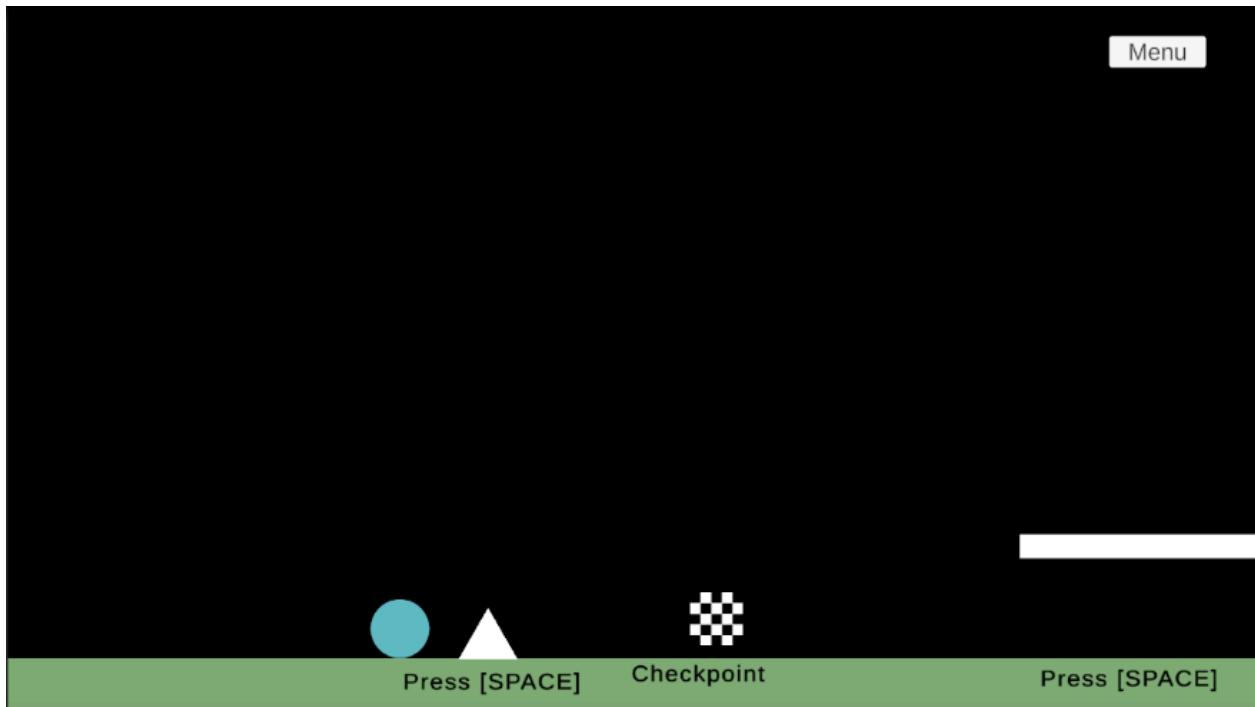
Description: Tutorial level, introduces obstacles and teaches players to use A and D keys or Left Arrow (<-), Right Arrow (->) to move left and right. This level also introduces background switching mechanics using the 'C' key. In this level players learn how to use the 'SPACE' key to jump. Players are also introduced to traps here.

Menu



Gold:

Description: Tutorial level, introduces obstacles and teaches players to use A and D keys or Left Arrow (<-), Right Arrow (->) to move left and right. This level also introduces background switching mechanics using the 'C' or 'J' keys. In this level players learn how to use the 'SPACE' key to jump. Players are also introduced to traps here. Checkpoints have been added to the game, allowing players to restart from the most recent checkpoint of the level if they die.



LEVEL 2:

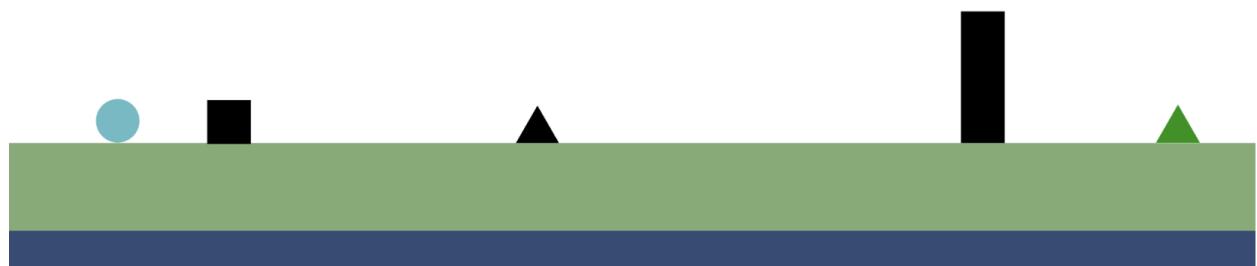
Alpha:

Description: Tutorial level, introduces traps on both white and black background.

Flips: 0 / 5

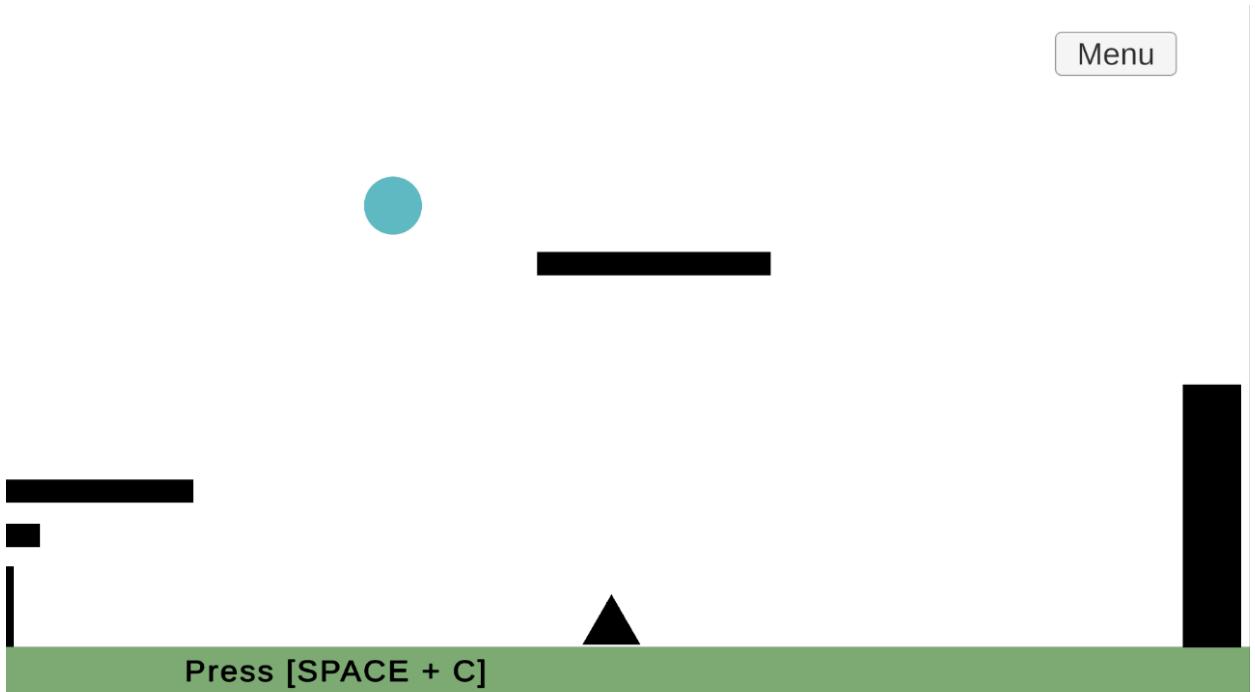
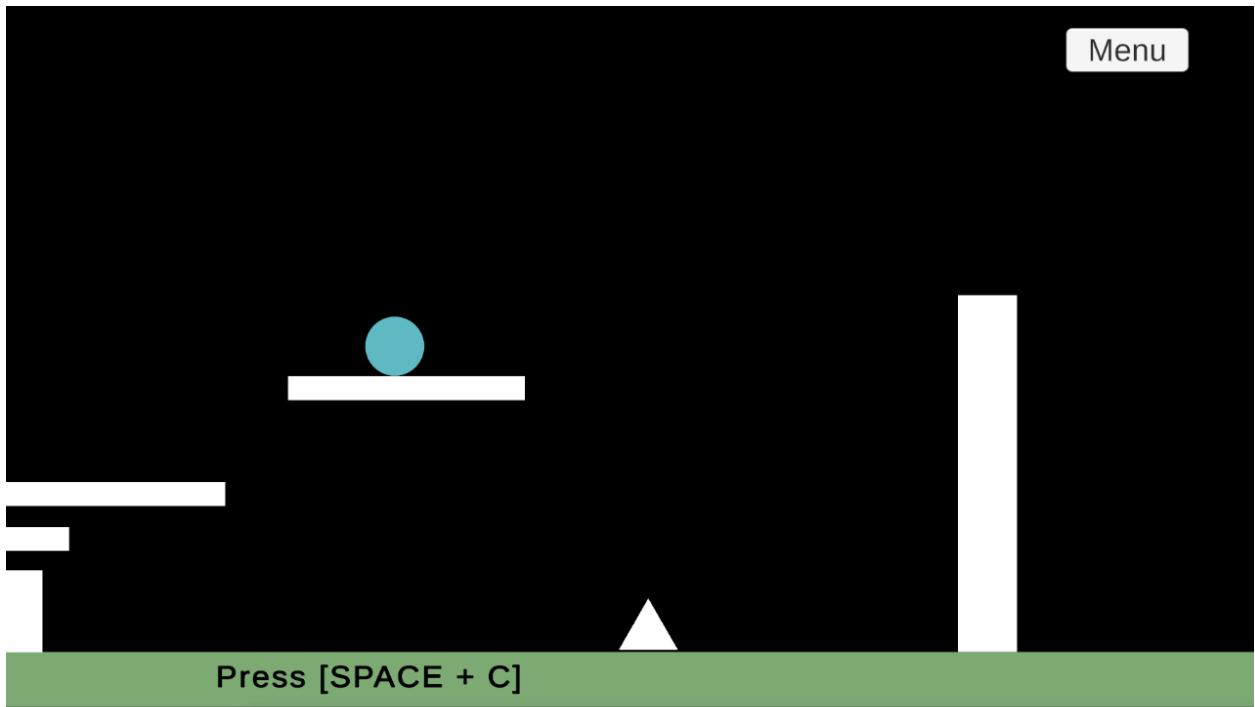
Level 2

Restart



Beta:

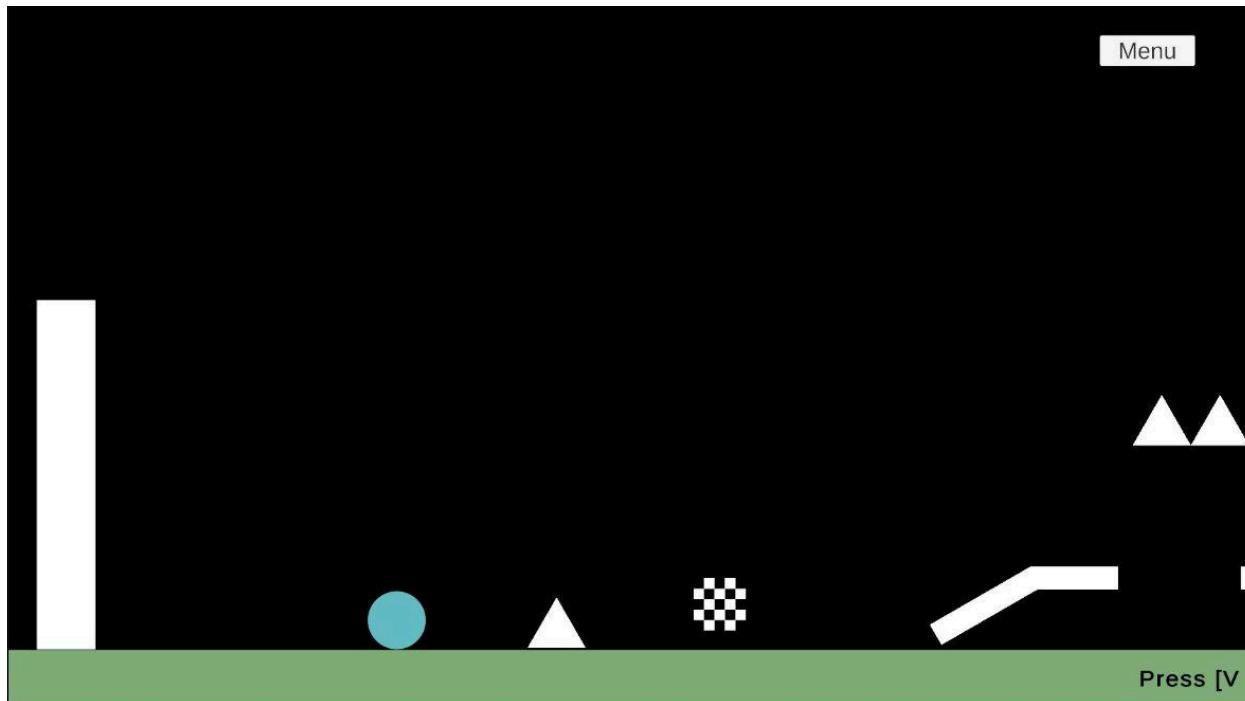
Description: This level builds on the skills practiced in Level 1, including traps, obstacles and cleverly hidden paths. It also includes the dashing, allowing players to dash across large gaps and navigate challenging sections.



Gold:

Description: This level builds on the skills practiced in Level 1, including traps, obstacles and cleverly hidden paths. It also includes the dashing, allowing players to dash across large gaps

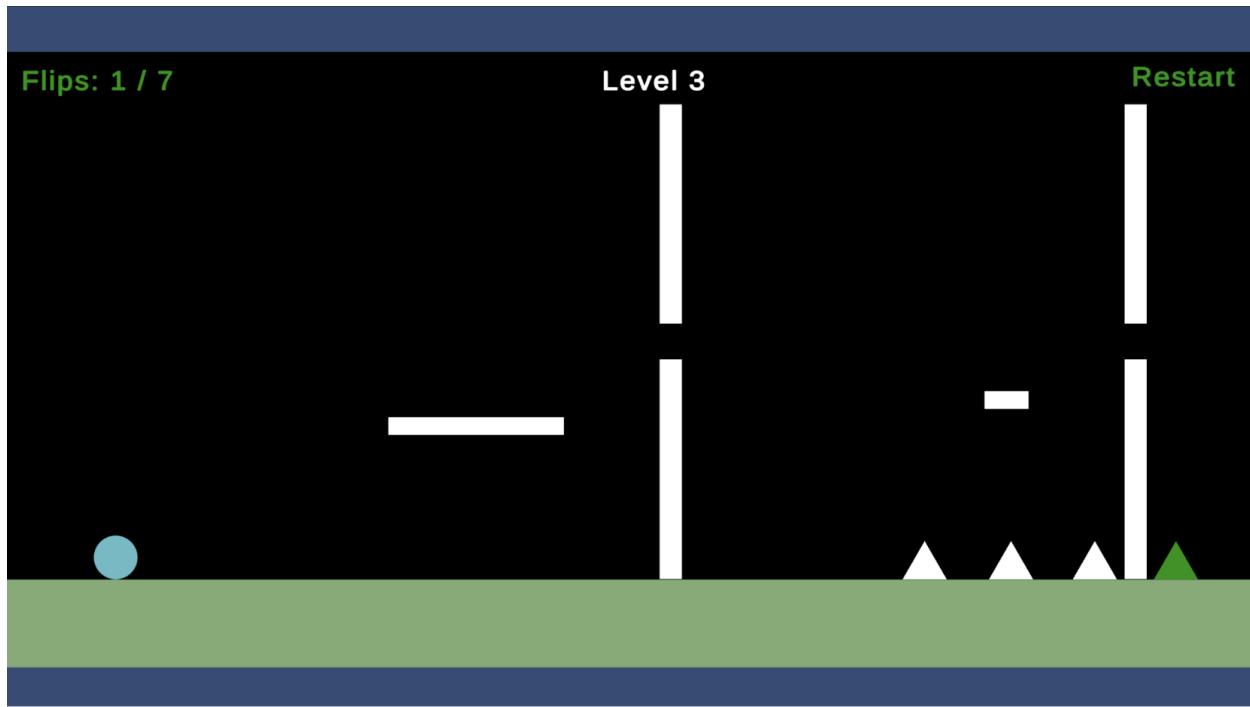
and navigate challenging sections. Checkpoints have been added to the game, allowing players to restart from the most recent checkpoint if they die.



LEVEL 3:

Alpha:

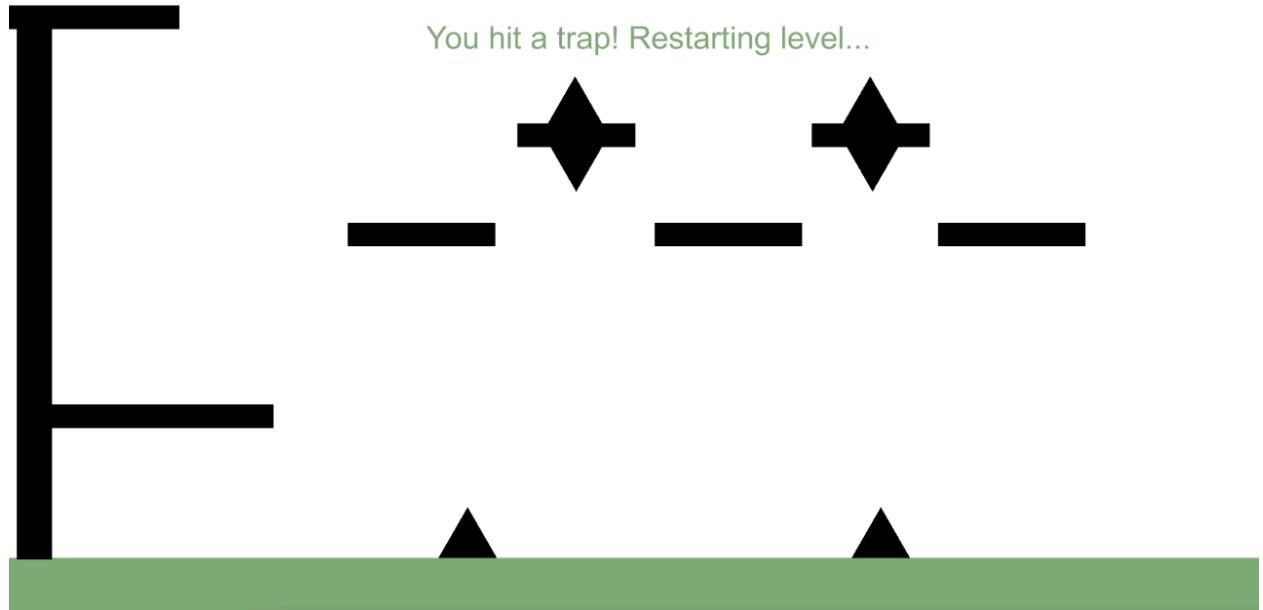
Description: Challenging level, makes players use strategies to navigate through the obstacles and traps.



Beta:

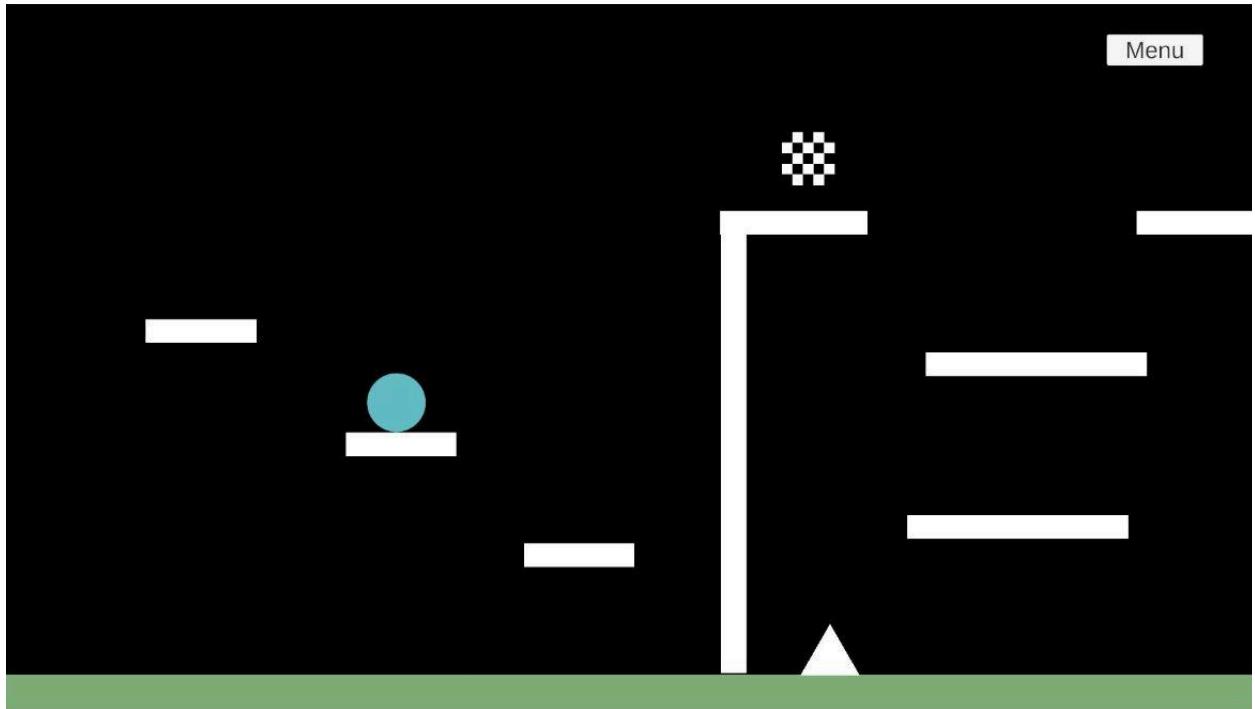
Description: Challenging level, makes players use strategies to navigate through the obstacles and traps. This level also introduces moving traps and moving platforms. Players can use the skills they learnt in previous levels to navigate through the path here.

Menu



Gold:

Description: Challenging level, makes players use strategies to navigate through the obstacles and traps. This level also introduces moving traps and moving platforms. Players can use the skills they learnt in previous levels to navigate through the path here. Checkpoints have been added to the game, allowing players to restart from the most recent checkpoint if they die.



LEVEL 4:

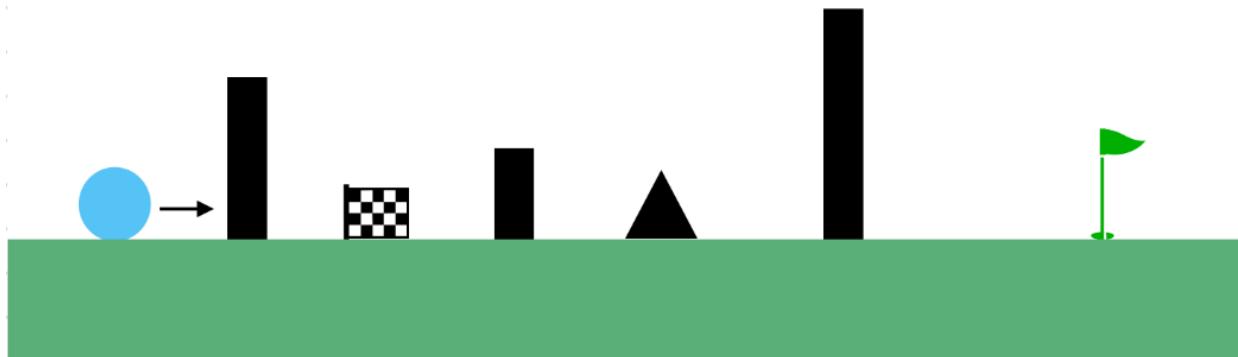
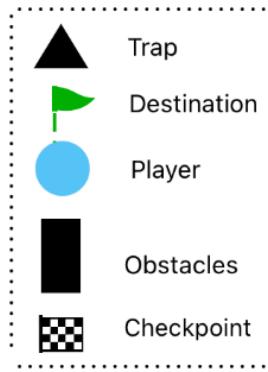
Gold:

Description: Most difficult level, players use strategies to navigate through the obstacles and traps. All previous mechanics, jumping and dashing are combined into longer and more complex challenges. This level also has moving traps, tunnels and moving platforms. Players can use the skills they learnt in previous levels to navigate through the path here. Checkpoints have been added to the game, allowing players to restart from the most recent checkpoint if they die.

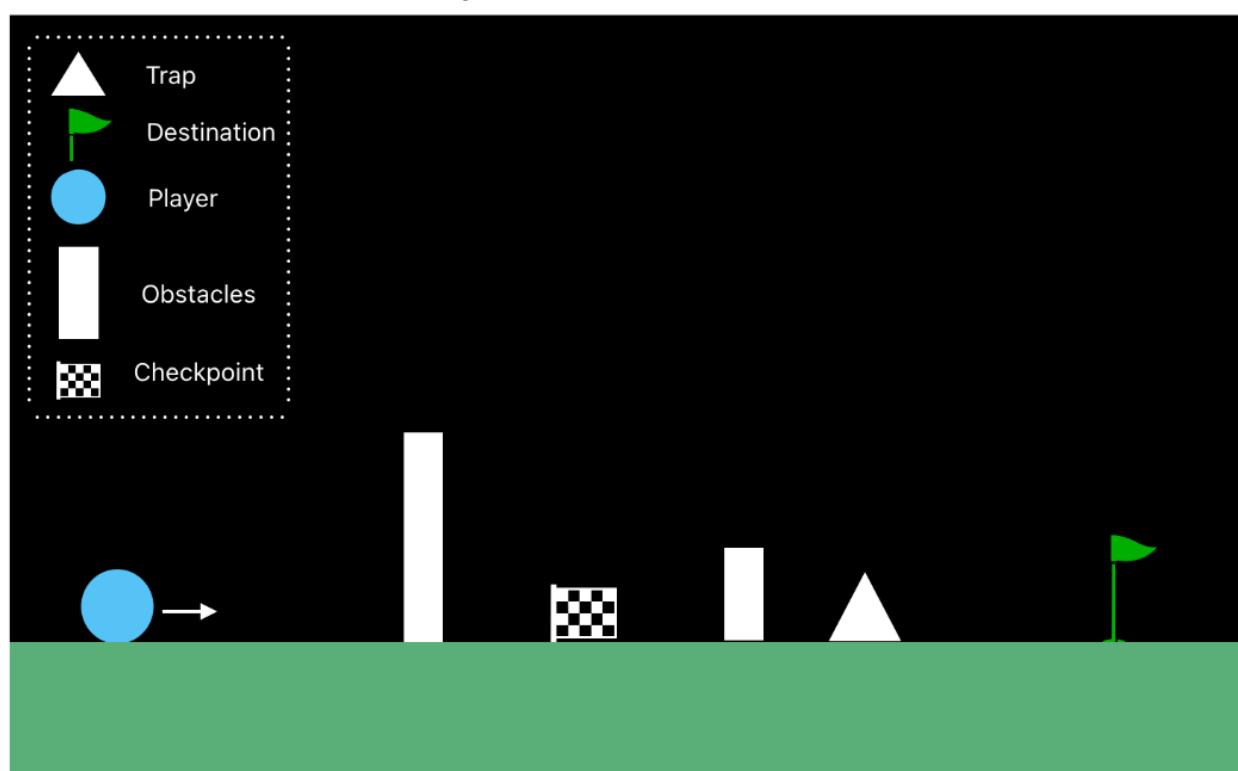
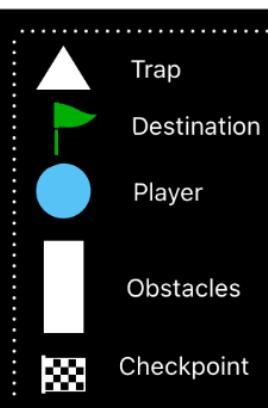


Concept Art

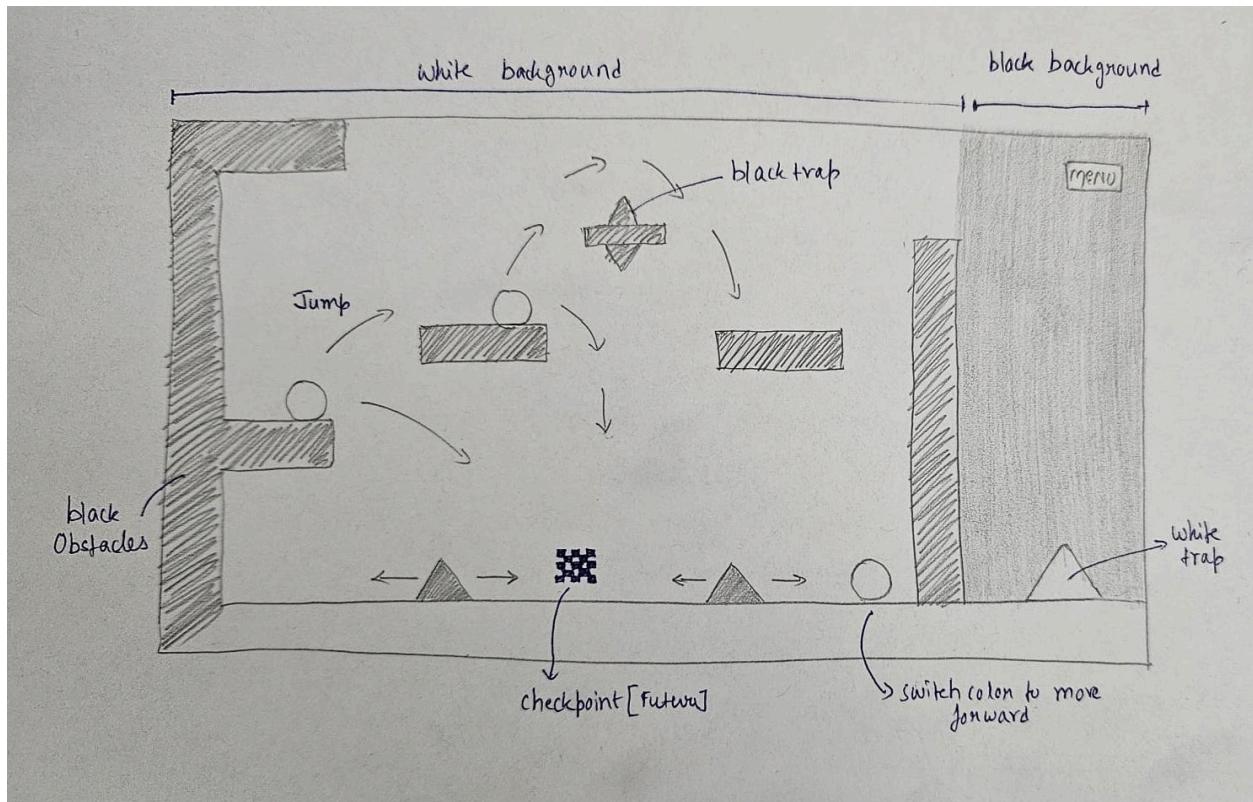
Game environment with white background:



Game environment with black background:



Mechanic/Level Sketches



Game UI

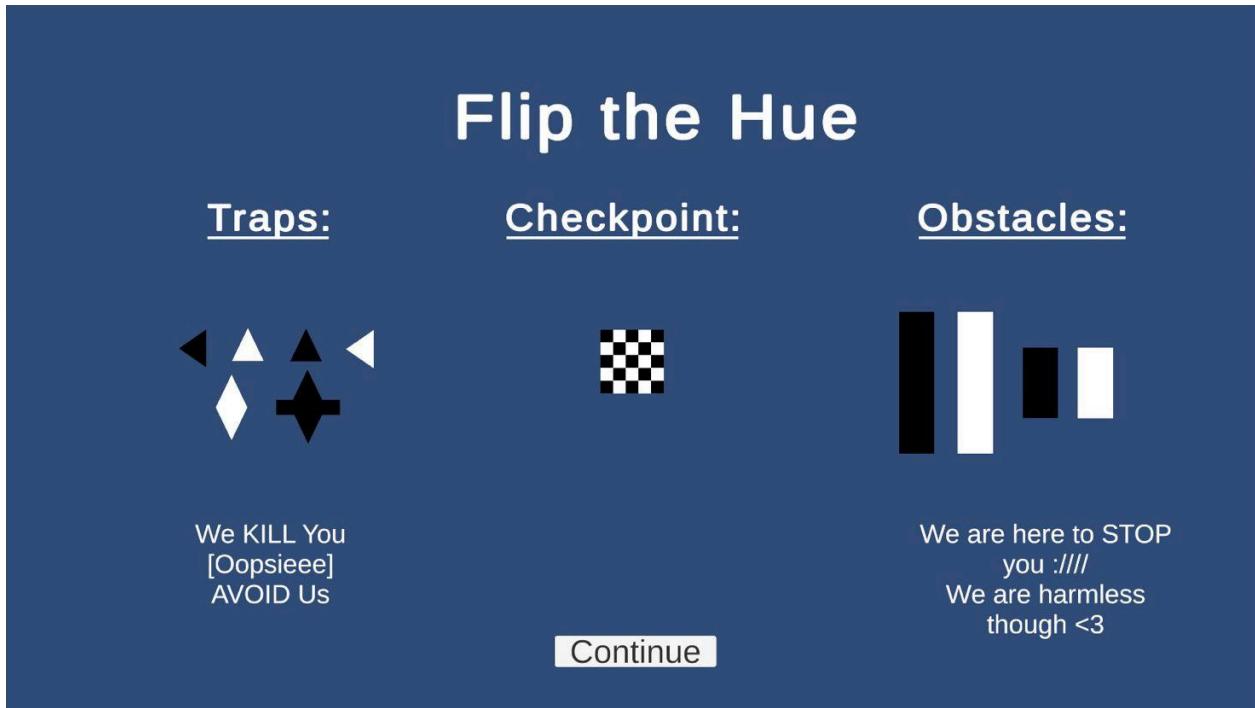
The game UI contains all the necessary options for a player to go through our exciting gameplay and instructions. Players are allowed to navigate all the levels directly from the Menu Screen.

Components of UI include:

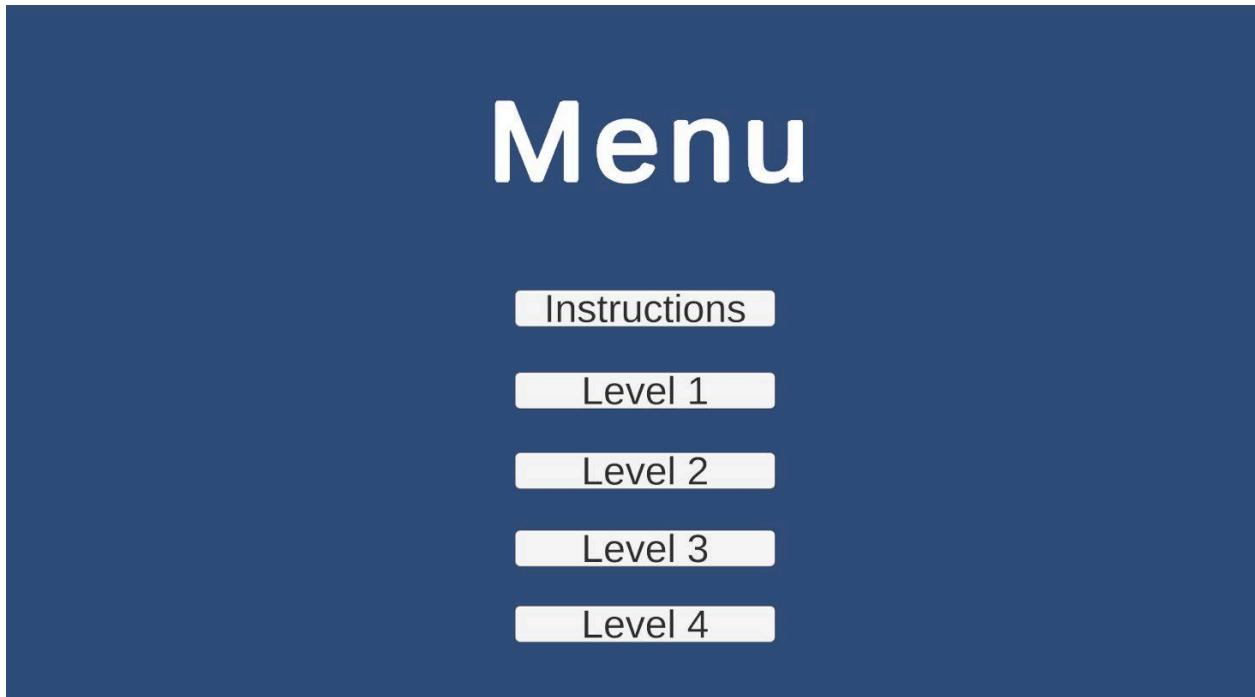
- Instruction Welcome Screen
- Menu Screen
- Winning Screen (for the level)
- Victory Screen (for clearing the last level)
- Game Over Screen(players' reason to die shown in the screen)
- Menu Button

Menus

Instructions screen: This screen explains the difference between traps and obstacles. Traps will kill the player, while obstacles will not.



Menu screen: This screen provides options to navigate to the instructions screen and the three levels in the game: Level 1, Level 2, and Level 3.

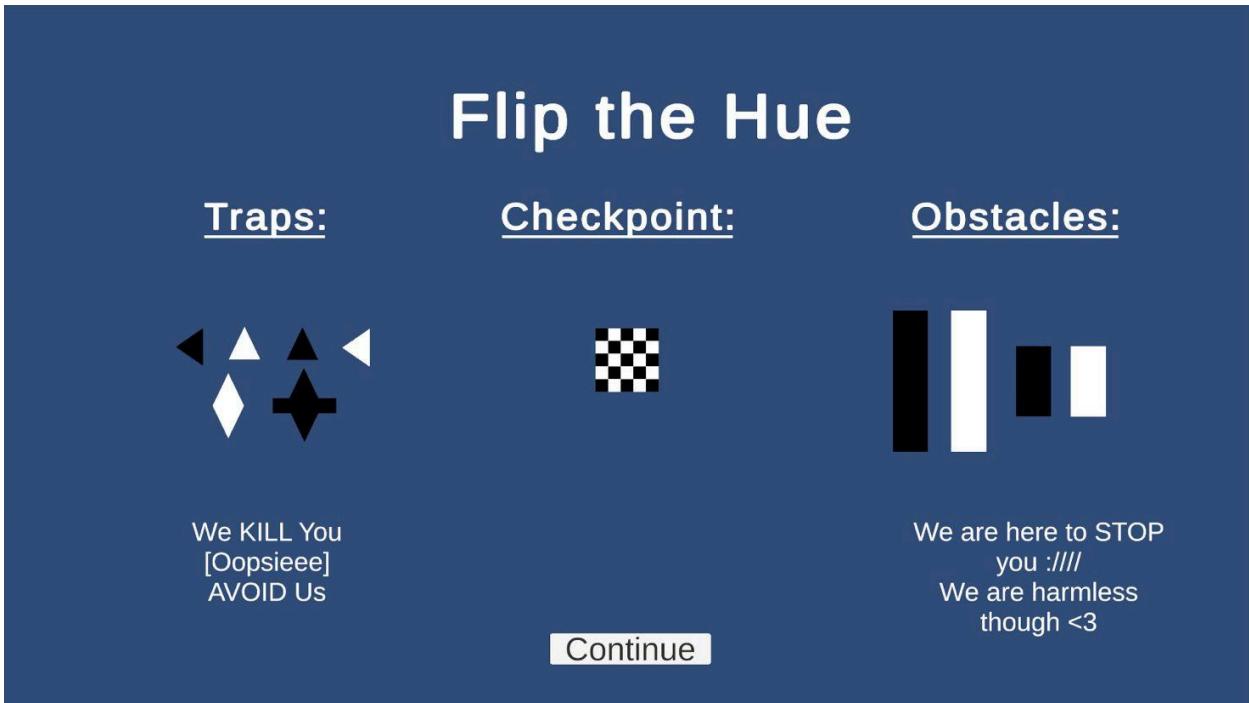


HUD

Add screenshots of HUD elements used within your game.

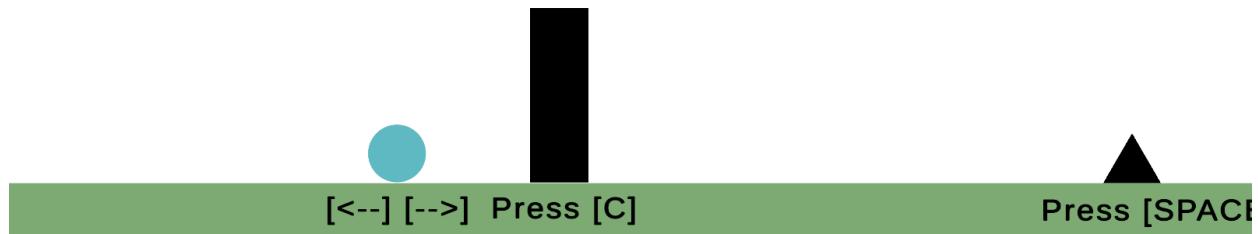
Players will start from the instruction screen and then continue on to the menu screen. Players can choose the level they want to play from the menu screen.

Game play information page:



Menu button is added to each level.

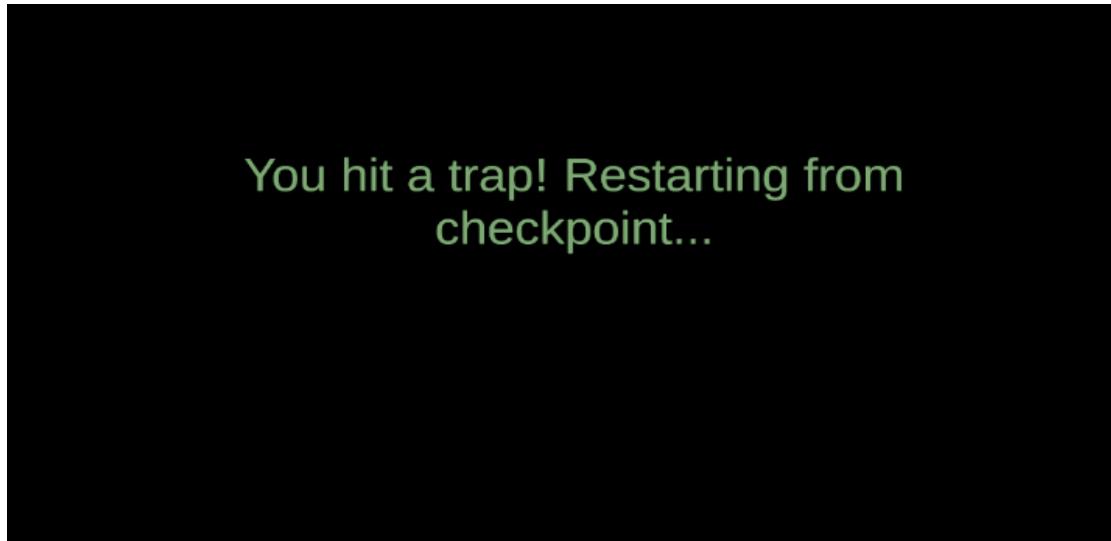
Menu



Menu Button: This button will take the player to the menu screen where the player can choose to navigate to the instructions screen and any of the existing levels.

Menu

Game Over: This text tells the player that you got killed as you hit the trap. The player will respawn at the last activated checkpoint



Level Passed: This text tells the player that you have cleared the level before moving on to the next level.

Level Passed!

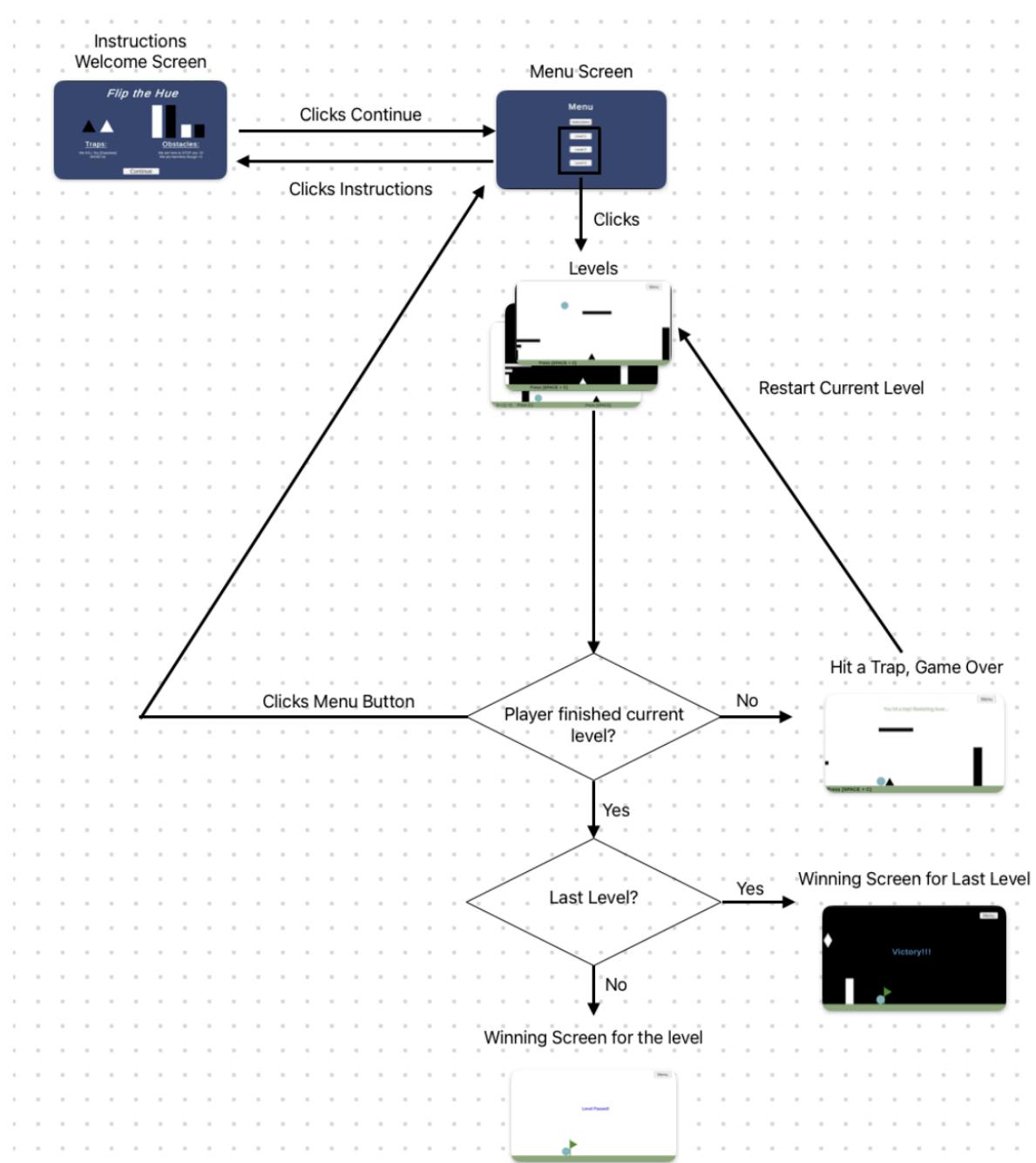
Victory: This text tells the player that you have cleared the last level.



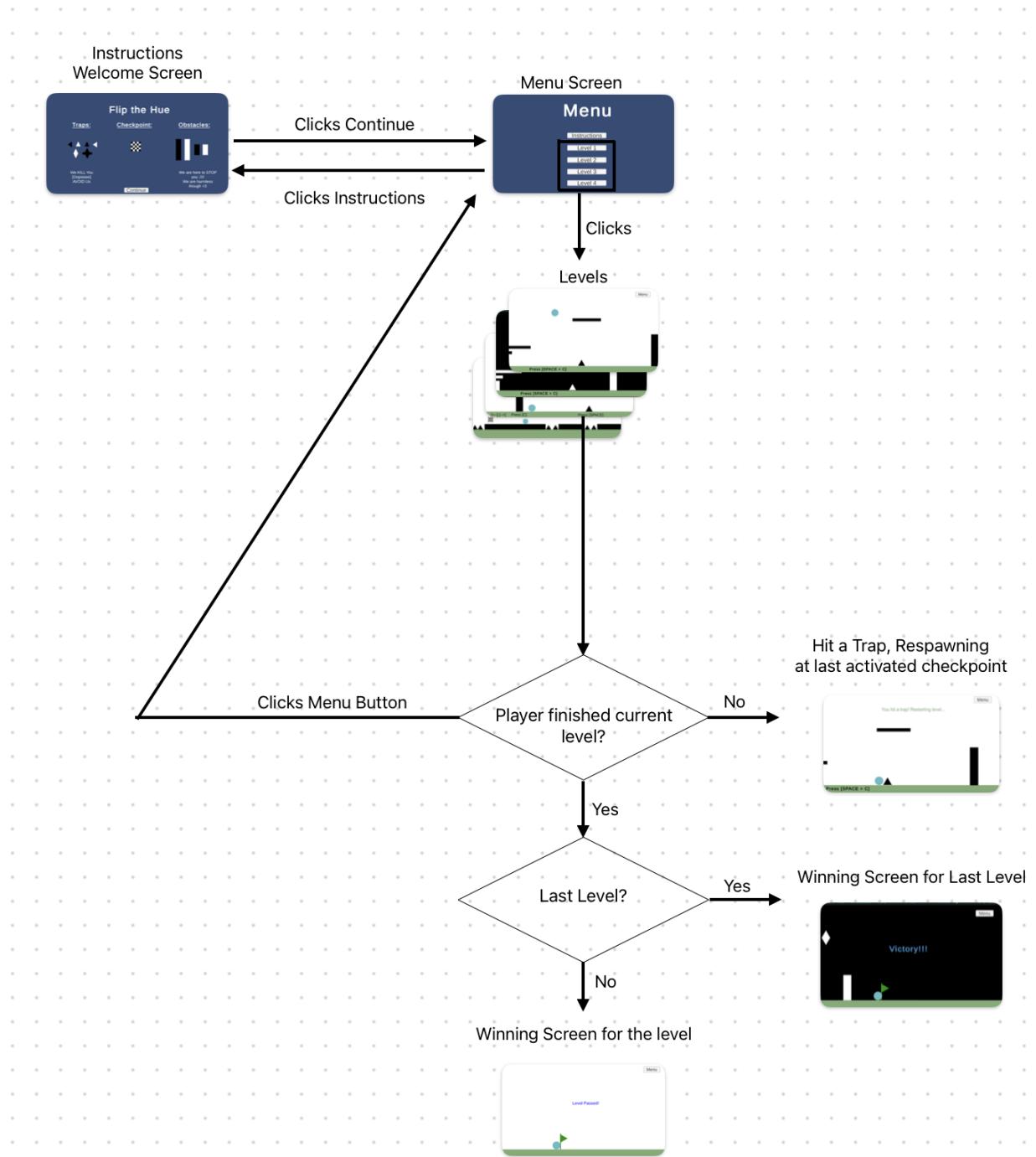
Victory!!!

UI Flowchart

Beta:



Gold:



Analytics

Methodology Used:

1. Data Collection:
 - JSON file added to at the end of every level
 - Json file uploaded to firebase through Unity Web Requests when closing or beating the game
 - <https://console.firebaseio.google.com/u/0/project/flipthehue/database/flipthehue-default-rtdb/data>
2. Data Visualization:
 - Fetch data through Firebase APIs
 - Process and Filter data
 - Visualize the data with Python and matplotlib.pyplot library

Custom Beta Survey Questions:

- a. What feature do you find more engaging in Flip the Hue?
 - i. Background switching mechanic
 - ii. Satisfaction of discovering hidden paths
 - iii. The thrill of completing a level after multiple tries
 - iv. The tension created by avoiding traps
- b. How do you feel about the current difficulty progression of the game? Are there any levels that feel too easy or too challenging?
- c. What kind of new obstacles or mechanics would you like to see added to make the gameplay more exciting? Please read through this and if everything seems good, we can just paste these answers on the form.
- d. If the game were to introduce a new ability, such as wall-climbing, teleportation, or gravity flipping, which would excite you the most and why?

Gold: Another relevant question:

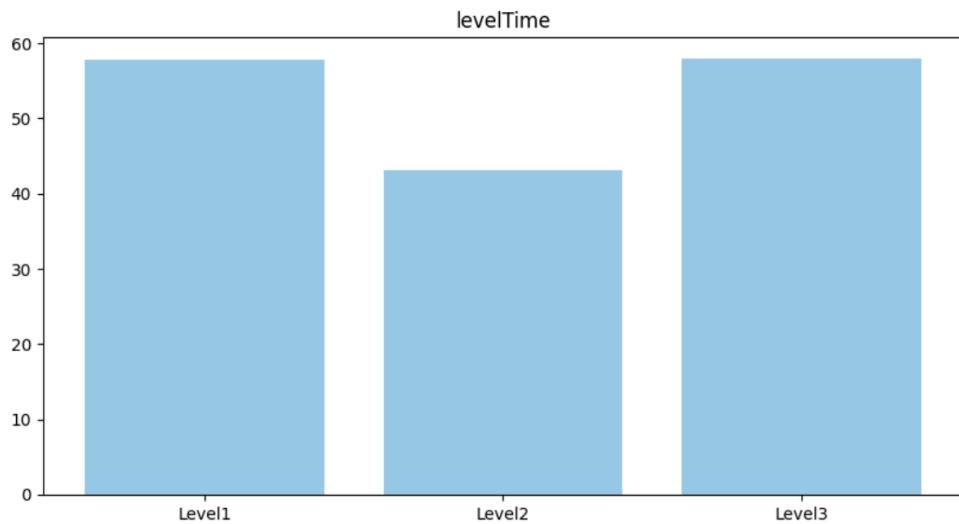
How do you feel about the overall atmosphere of the game (e.g., sound design, visual style, or level transitions)? Are there any suggestions you'd make to enhance the immersive experience?

Metrics

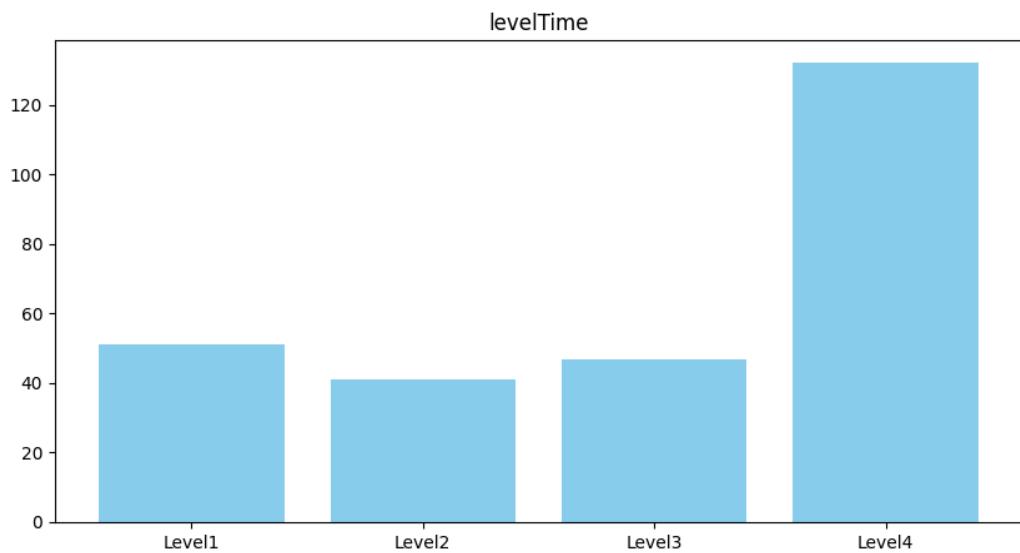
Metric #1: Level Completion Time (Paired with Number of Death & Color Flips)

Description: This metric records the time players take to complete each level. It highlights the duration spent navigating puzzles, switching backgrounds, and avoiding traps.

Beta:



Gold:



Justification:

Tracking completion time offers insights into level difficulty and player engagement. Combined with the metrics number of Death and Color Flips, it provides a reliable way to analyze player struggles and the clarity of level design. Specifically, a high completion time paired with high deaths might indicate overly complex traps, while a high time with excessive color flips could suggest unclear visual guidance. Moreover, if players consistently spend more time on certain levels, it may indicate a need for adjustments in difficulty or additional guidance. Shorter times might suggest the level is too easy, whereas longer times could reveal overly complex challenges. By analyzing these trends, the team can refine levels to better match player skill progression and game flow.

Interpretation:

The graph shows the time players spend on each of the first three levels in a game. Levels 1 and 3 have similar high times, while Level 2 has a noticeably lower time spent. This pattern suggests that Levels 1 and 3 take players more time to complete, potentially indicating greater complexity or challenges in these levels. In contrast, the shorter time spent on Level 2 suggests it's easier or quicker for players to complete.

Since Levels 1 and 2 are meant to be introductory, the high time on Level 1 may indicate that it's slightly more challenging for players than intended. Meanwhile, the high time on Level 3 aligns with its purpose as a harder level, creating a clear progression in difficulty. This insight can help guide adjustments, such as simplifying Level 1 slightly to match Level 2's ease or ensuring Level 3's difficulty remains balanced to prevent player frustration.

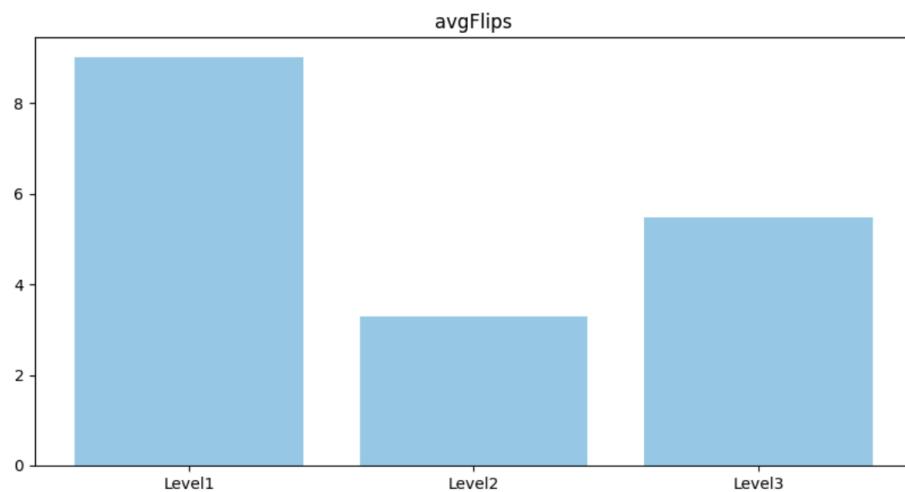
Hypothesis:

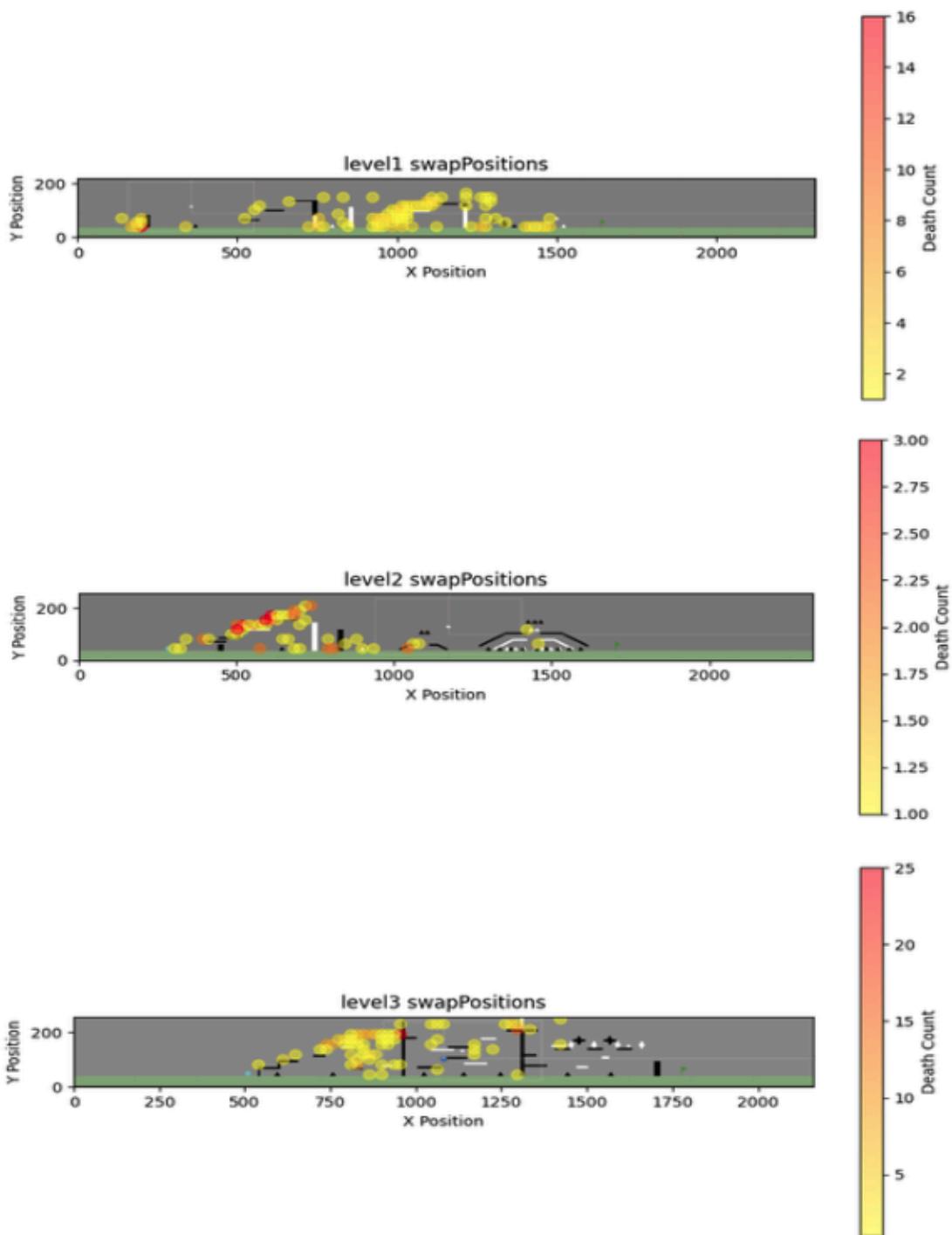
The hypothesis for this graph is that players spend more time on levels based on both difficulty and familiarity. Level 1 likely takes players longer because it is their first experience with the game, requiring them to learn the mechanics and controls, while Level 2 is completed faster as players become more familiar with the gameplay. The higher time on Level 3 reflects a deliberate increase in difficulty, marking it as the first significant challenge after the easier introductory levels. This suggests that the progression from learning to a challenging experience is effectively structured.

Metric #2: Average Flip Used for Each Level

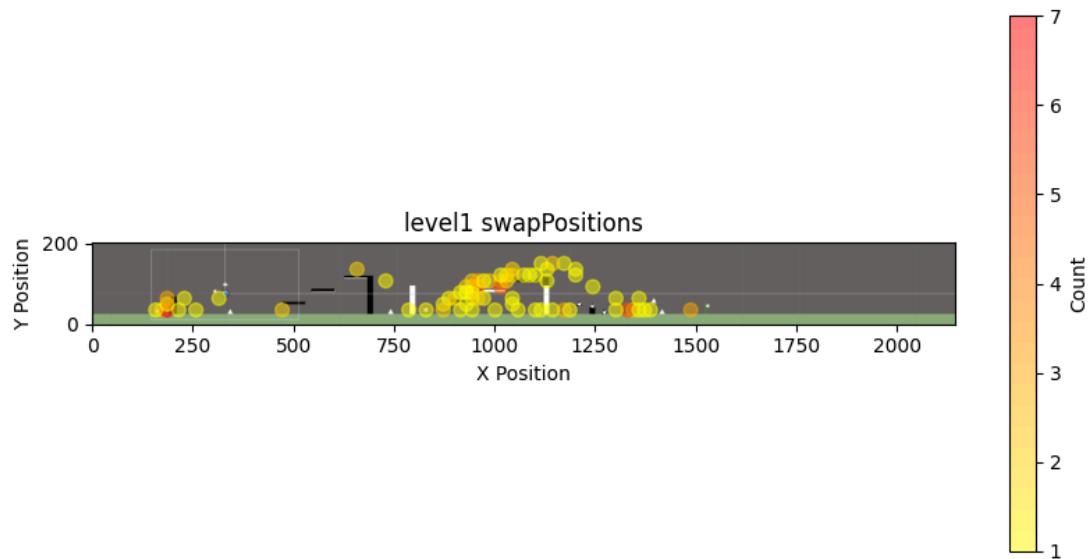
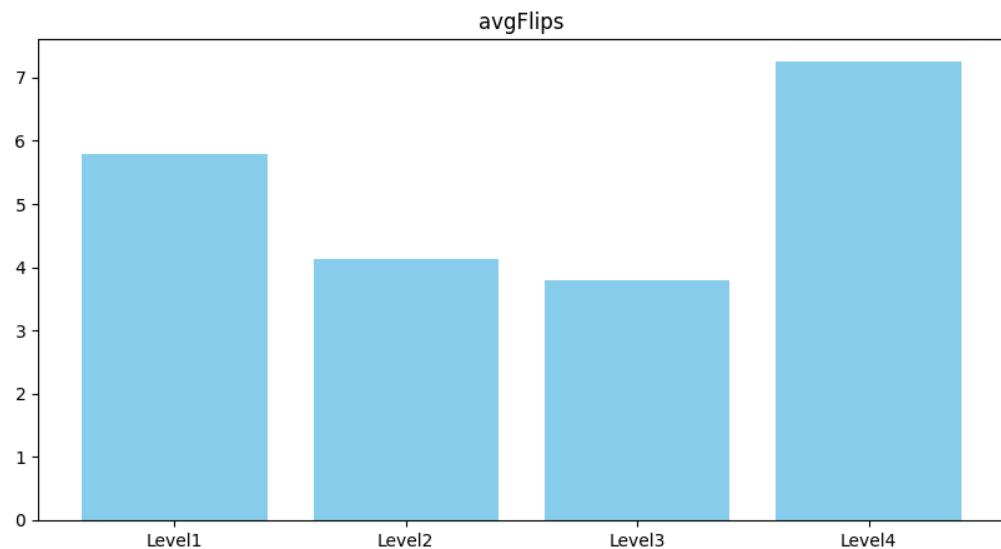
Description: This metric tracks how often players switch between black and white backgrounds during each level.

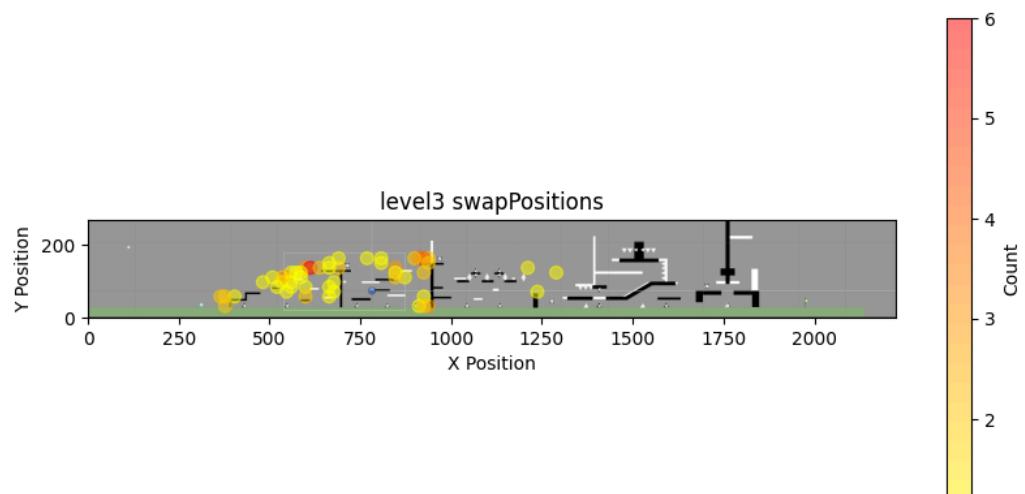
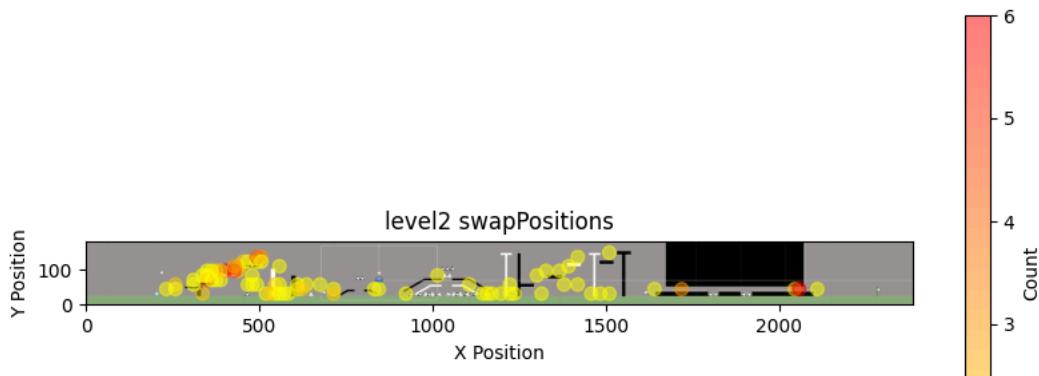
Beta:

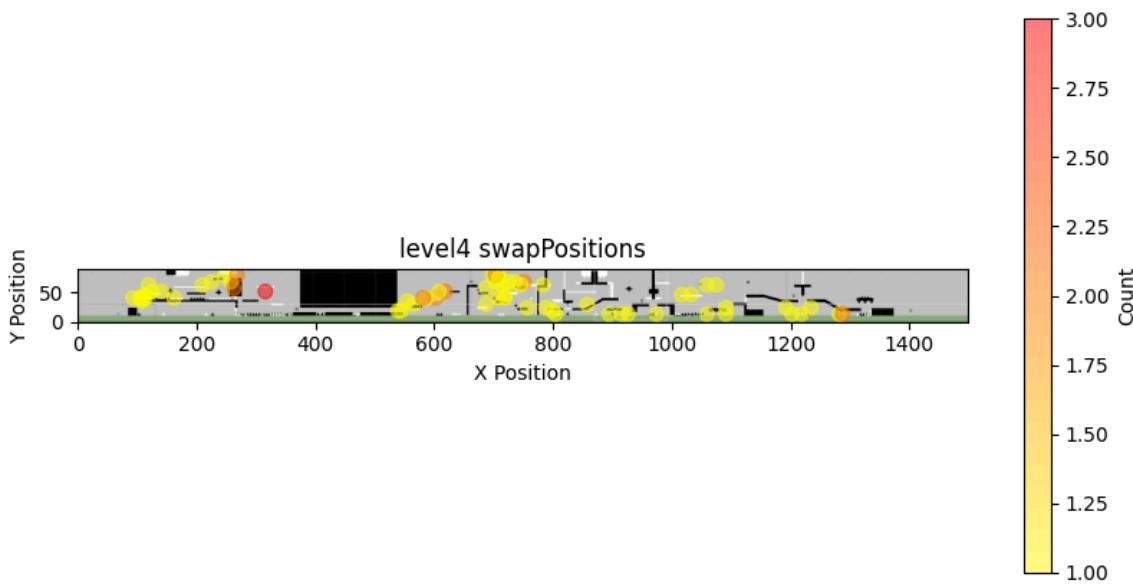




Gold:







Justification:

Monitoring the frequency of background flips helps measure how well players are engaging with the core mechanic. A high flip frequency may suggest that players are struggling to time their actions, while a low frequency might indicate that players are mastering the mechanic. This data can guide level design adjustments to ensure a balanced difficulty.

Interpretation:

From the bar chart, it shows that Level 1 has the highest average flips, followed by Level 3, with Level 2 having the fewest. This pattern suggests that players are likely experimenting more with flips in Level 1 as they learn the controls, while the increase in flips in Level 3 indicates a need for more maneuvering due to its higher difficulty.

We can see the clusters of flips around specific areas in the level, especially near obstacles or traps from the heatmaps above. This pattern indicates that players tend to use flips frequently in these areas to navigate around challenges.

Hypothesis:

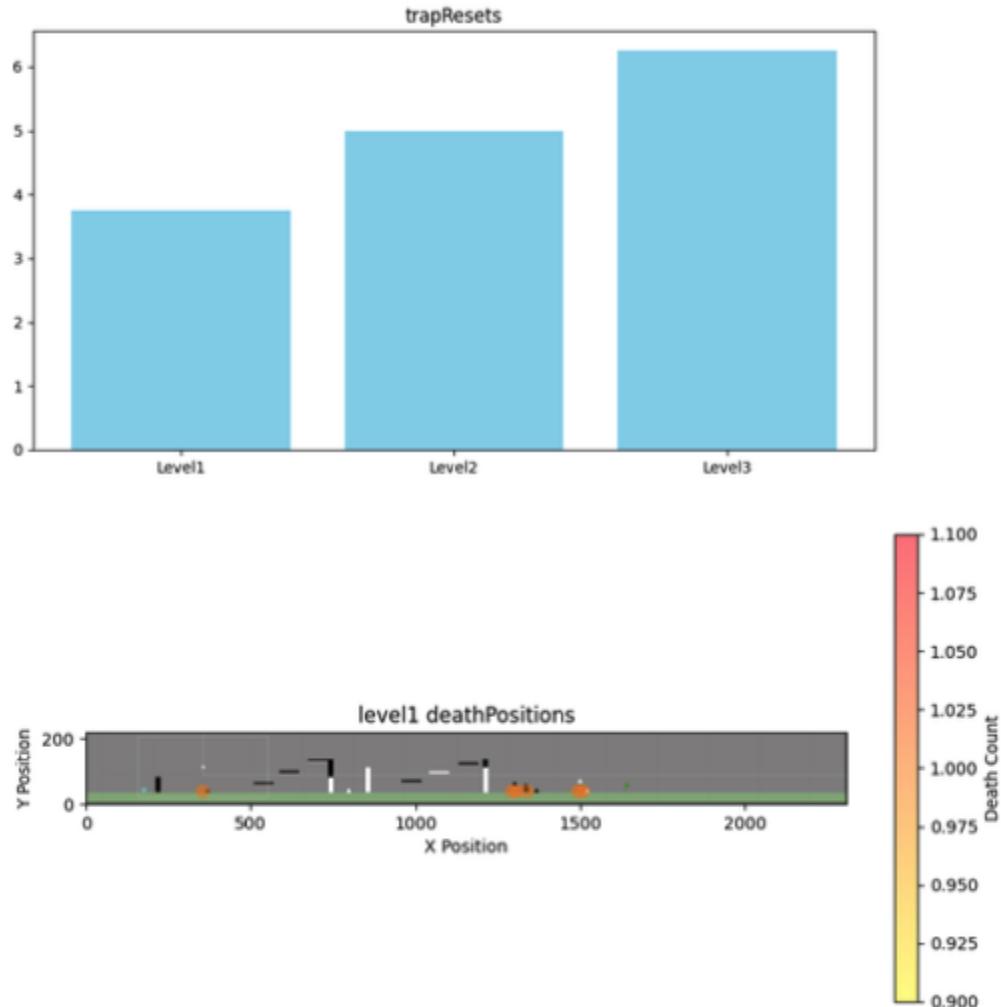
Based on the bar chart, our hypothesis is that players perform more flips in levels where they are either unfamiliar with the mechanics or face increased difficulty, leading to higher flip counts in introductory and challenging levels. Also, from the heatmaps, the flip operations cluster near obstacles or difficult sections of the level, suggesting that players strategically use flips as a

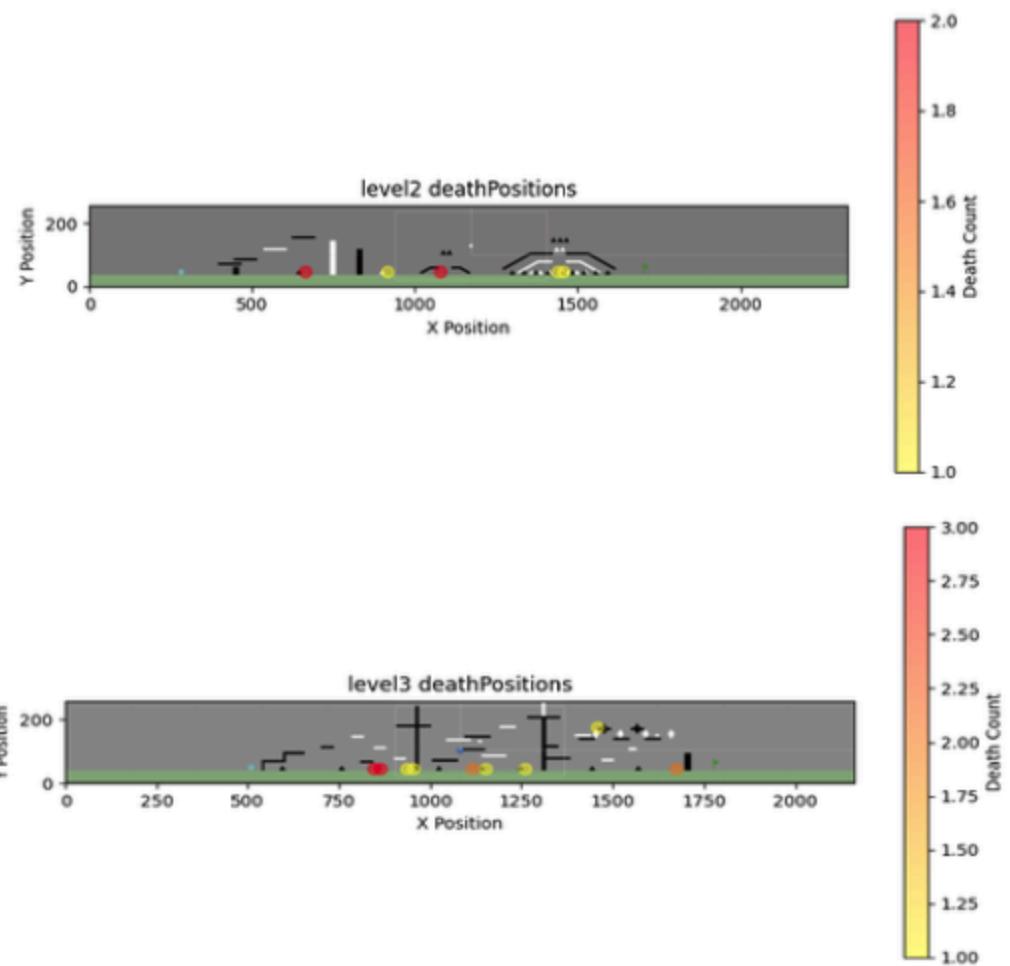
response to environmental challenges. This result can help us to better understand when players will intuitively use flip to pass the level, and we can change the level design accordingly.

Metric #3: Average Number of Resets for Each Level

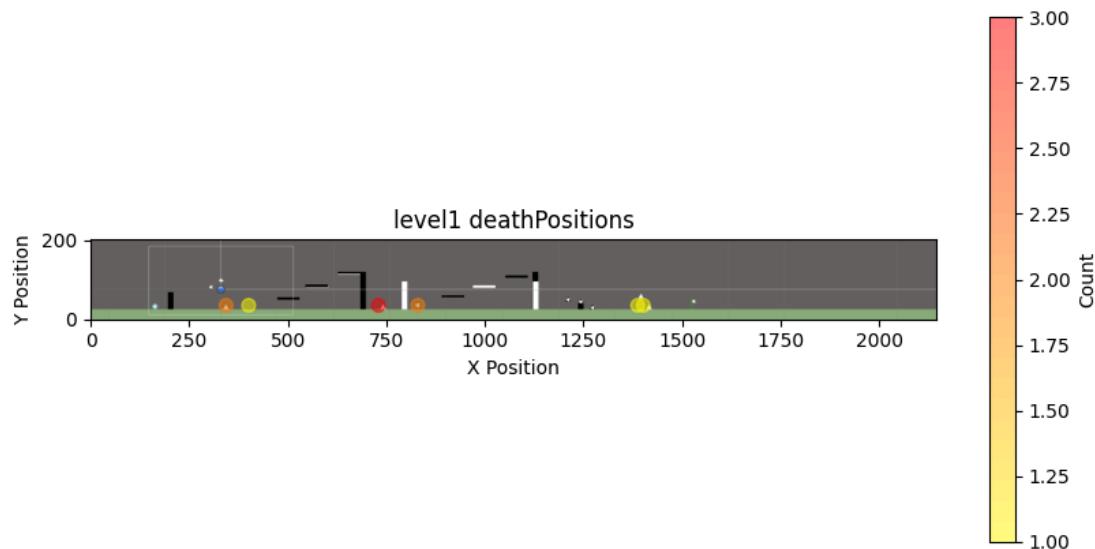
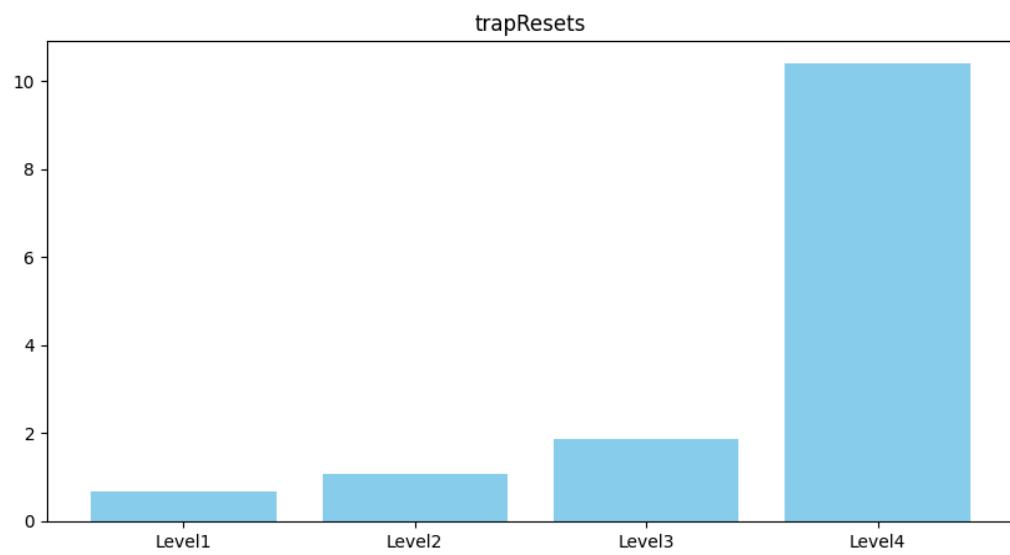
Description: This metric counts the average number of players hitting traps

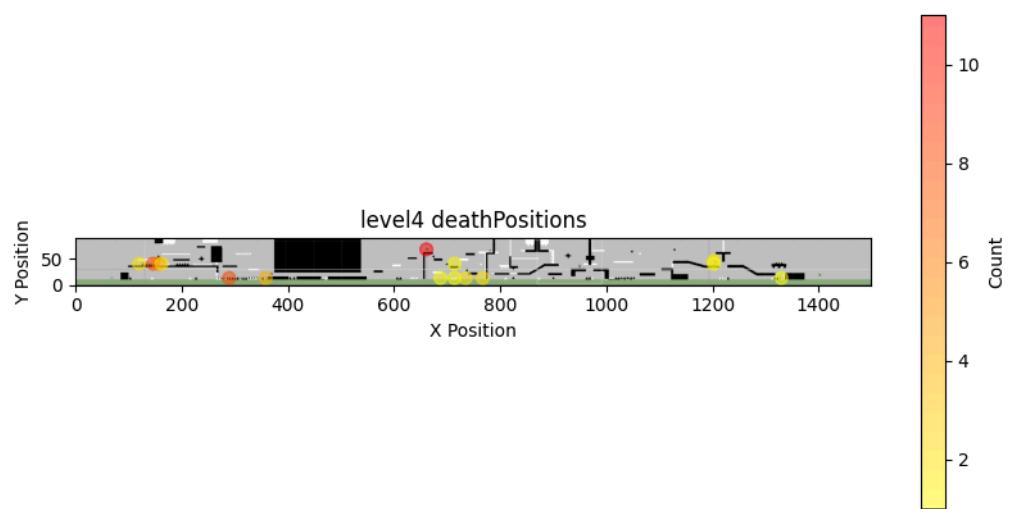
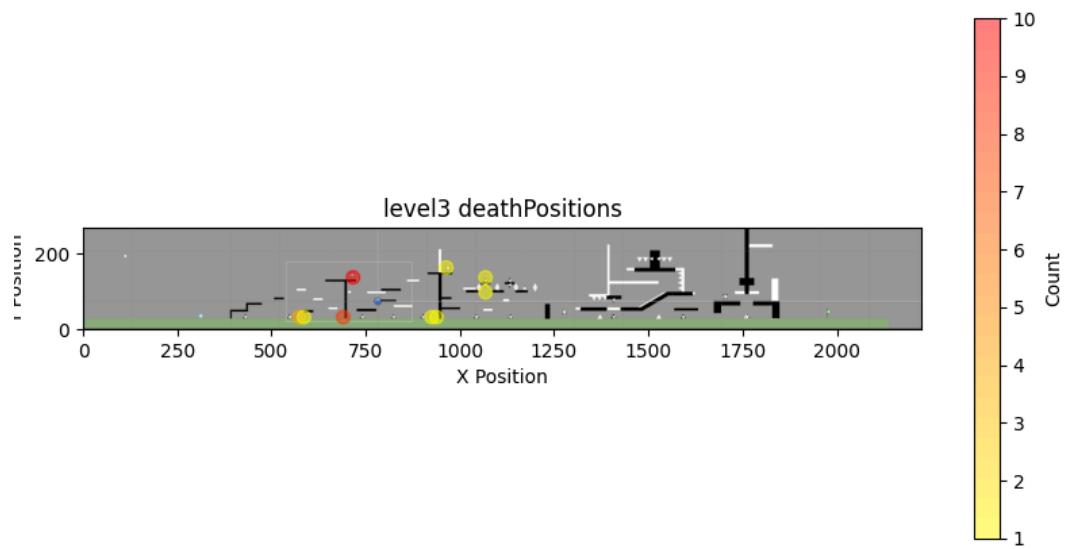
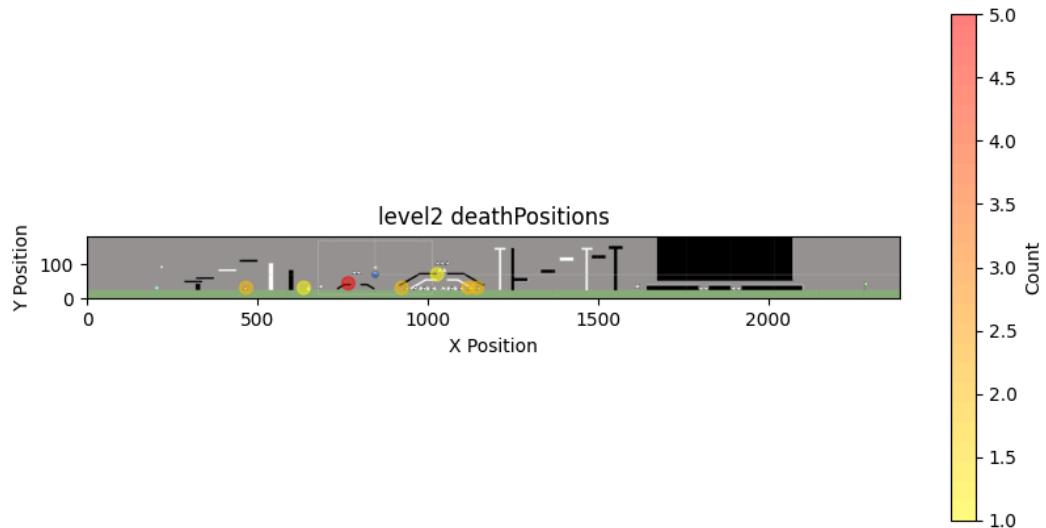
Beta:





Gold:





Justification:

Analyzing trap encounters will help determine whether traps are functioning as intended. If players frequently trigger specific traps, it could mean the traps are too difficult or unfairly placed. This metric helps the team fine-tune trap positioning and overall challenge level, ensuring that traps enhance gameplay without causing excessive frustration.

Interpretation:

Based on the bar chart we can see that the levels steadily increase in difficulty with Level 1 having the least player deaths and Level 3 having the most player deaths. Seeing as the values are all generally high it would be helpful to lower the difficulty of Level 1 since it is mainly meant to serve as a tutorial level. If we were to remove some traps from level 1 we would also have to remove some from level 2 to smooth out the difficulty curve. We can also see through the heatmaps that players have trouble with the platforming and falling on top of spikes. In level 1 a large number of players die when they are falling from a platform and land on traps without switching. Level 2 also shows us that players are having trouble switching colors while mid air with many players falling on a spike beneath a staircase that you must climb while switching colors. Level 3 shows us that players have difficulty with moving traps and platforming, with a large number of player deaths occurring in a part of the level where players must jump while switching colors, while there are multiple moving traps on the floor beneath them.

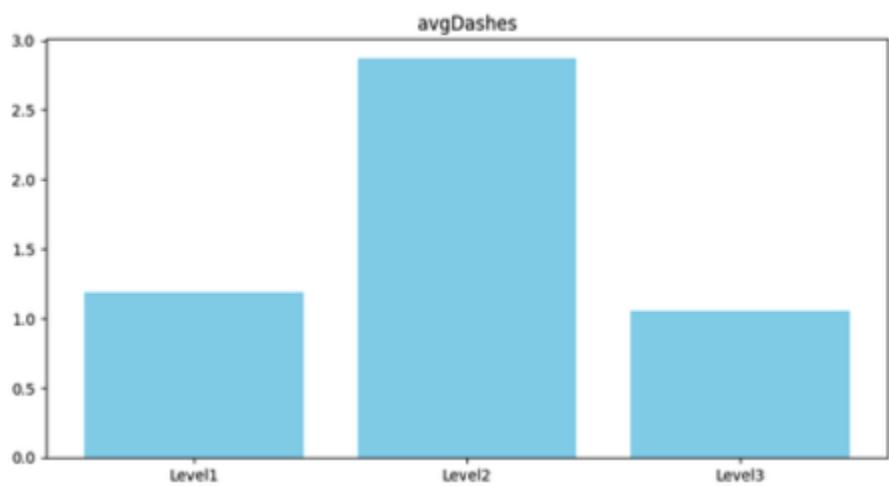
Hypothesis:

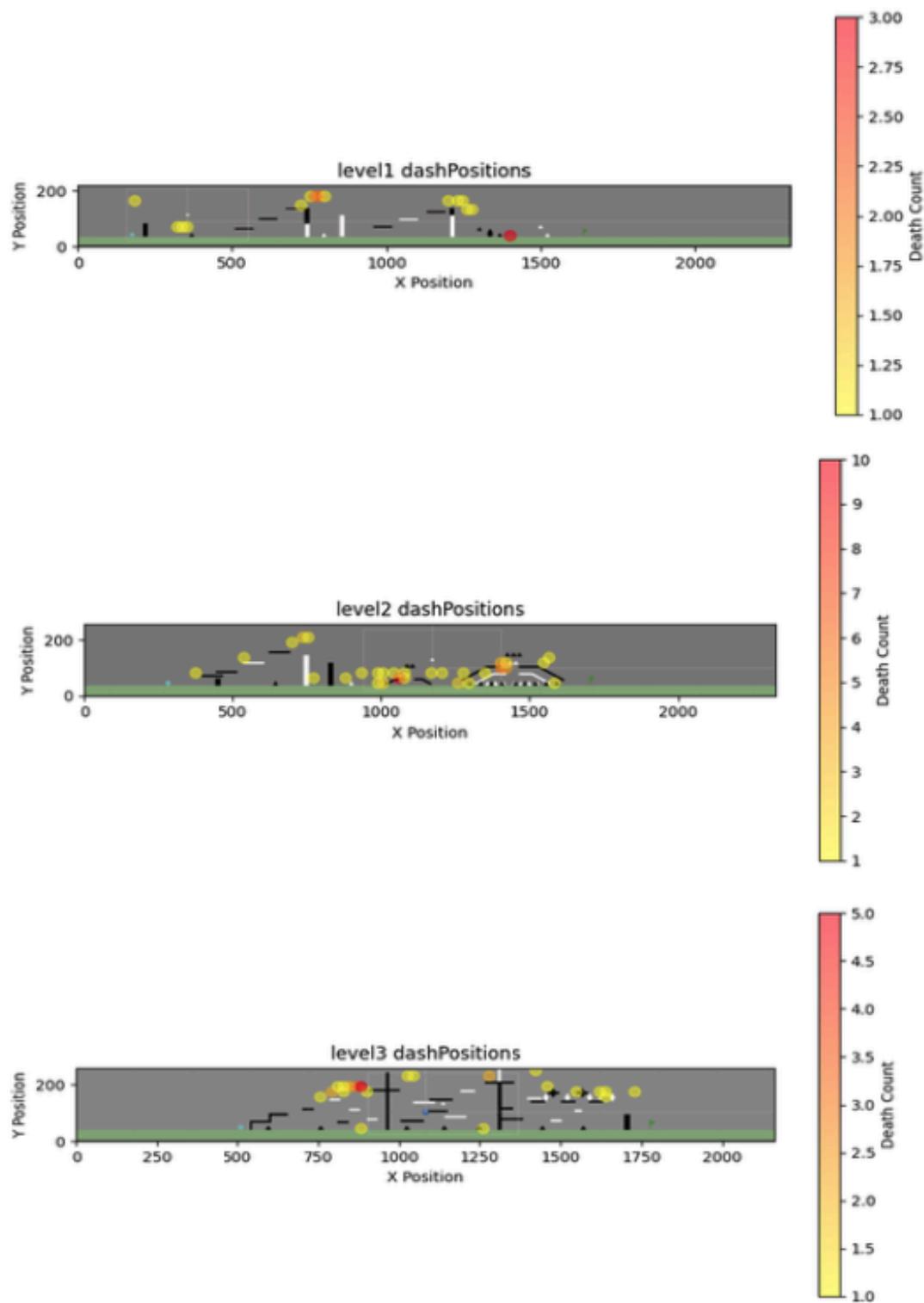
Our hypothesis is that the players might be having a difficult time initially with jumping over the spikes. Players might not be used to the game's controls at the point where they face their first spike trap and might accidentally land on it while trying to jump over it. A way we could fix this is by facing players with a small obstacle of the same size before they face their first trap so they can practice jumping over things before getting penalized for trying it. The latter half of level 1 might also be difficult with players needing to swap colors mid air due to the high number of deaths when players need to swap before touching the ground. This is further reinforced in the following levels with there being large clusters of deaths near where players need to switch colors while in mid air. In order to ease players into this, we think it would be helpful to have a simple platforming challenge where players must switch colors mid air using obstacles and without traps. This would let players get comfortable with the switching mechanic before needing to use it on the fly. We also might have to take a similar approach to tutorializing the dash mechanic since there is a large number of deaths when players first encounter the dash tutorial, which suddenly drops off at the next dash challenge.

Metric #4: Average Dash Used for Each Level

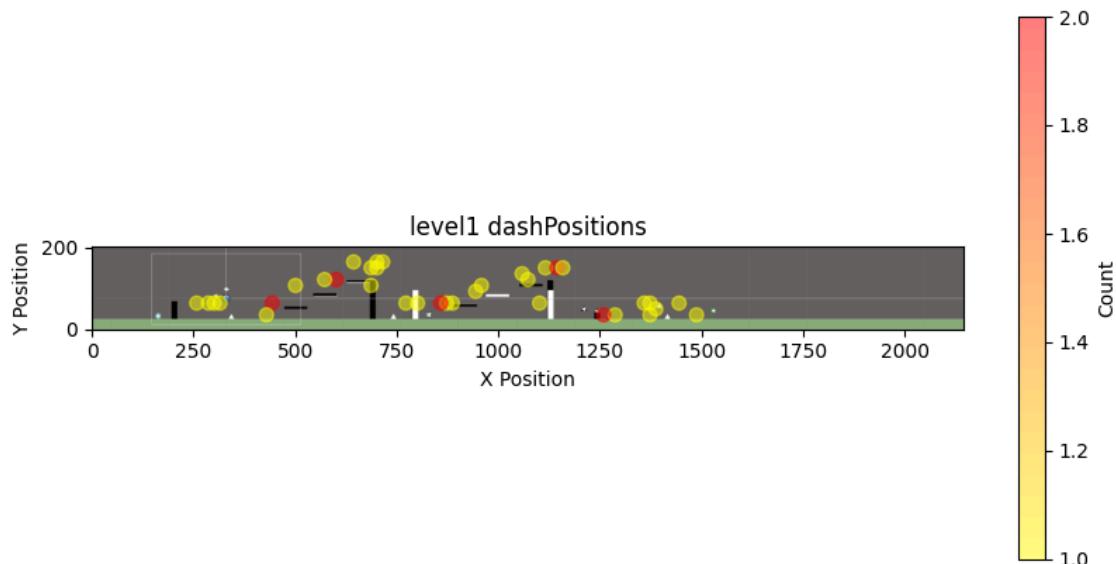
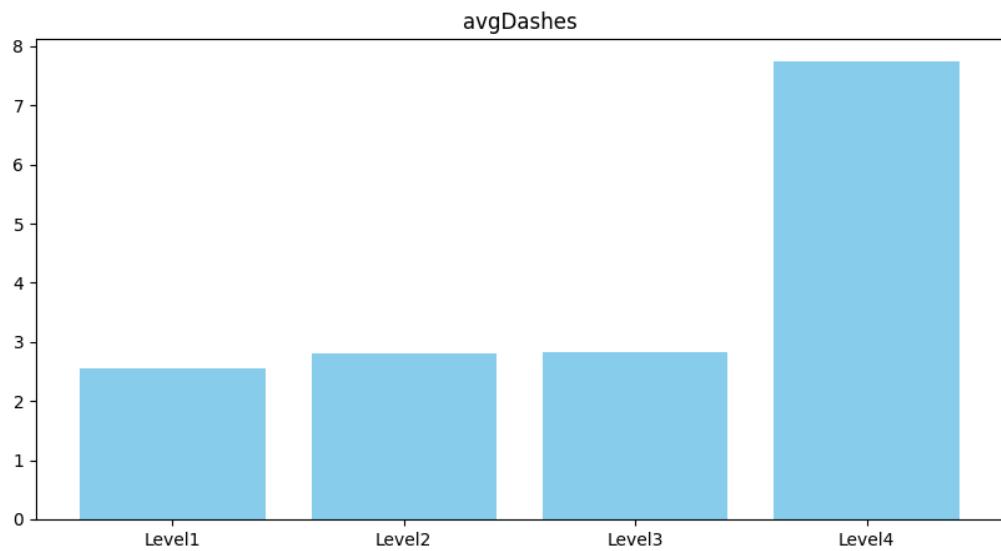
Description: This metric tracks the number of dashes that players use in each level.

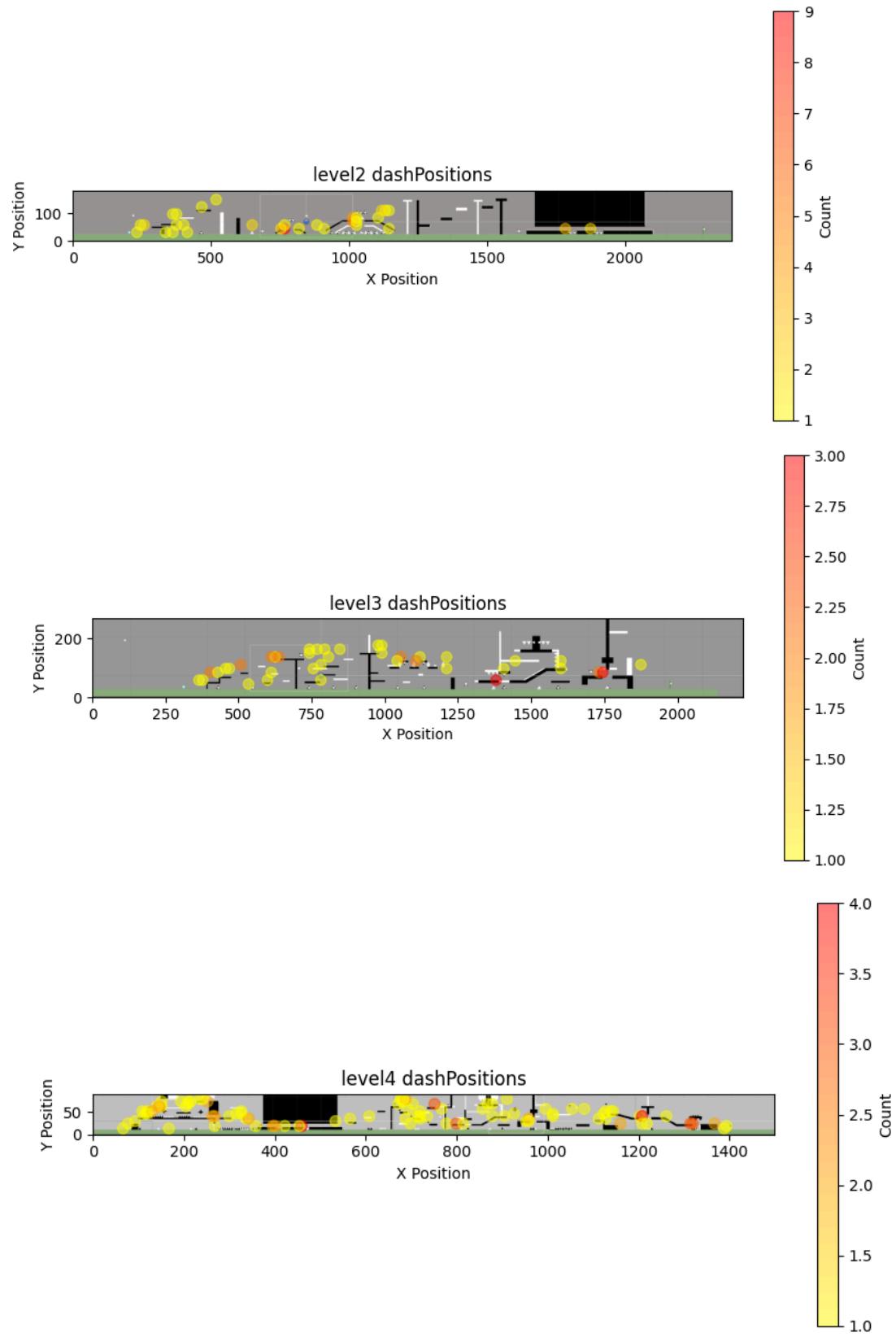
Beta:





Gold:





Justification: Dashing is a key interaction in platformers, and tracking dash count helps identify how players are navigating obstacles. A high jump count might indicate that players are struggling with level design or timing, while a low count could suggest that the level is too easy. This data can be used to fine-tune platform spacing and ensure the challenge is balanced for players.

Interpretation:

Taking a look at the bar graph we can see that the majority of players use dashes on level 2, and on levels 1 and 3 players dash on average once per level. Looking at the heatmaps we can see that when they aren't forced to dash, players tend to dash when they are jumping over a big gap. Players dash in level 1 to make sure they don't fall into a pit below them and to try and dash past a number of spike traps beneath them. In level 2, players mostly end up dashing in the 2 dash challenges that we have that force the players to dash. In level 3 we can also see that players use the dash to make up the distance in a large jump from 1 platform to the next. A couple players dash to avoid moving traps, but players mostly avoid these traps by waiting.

Hypothesis:

Our hypothesis for this data is that players don't feel the need to use the dash mechanic unless they are forced to. While there are a couple outliers with players dashing over gaps, players almost always only dash when presented with an obstacle that must be dashed through. We also see through level 3 that harder level design causes players to dash more often. It would be a good idea to add more difficult obstacles in level 2 and 3 that don't necessarily require a dash, but which dashing makes easier. These could be moving traps with large gaps the player must jump over, giving the player the choice of timing their jump properly or using the dash to successfully clear the challenge. Having more challenges like this and more challenges where the player must dash would further incorporate the dash mechanic into our game and make players more willing to use it. It might also be a good idea to tutorialize dash in level 1, since dash being tutorialized in level 2 might make players more wary of using the mechanic to get past platforming challenges.

Weekly Prototype Descriptions

Week-8:

- Designed the mechanic **Move and Jump** to make sure the speed of the character is within the normal range.
- Implemented the basic **color-switching** functionality.
- Tested for smooth transitions and interactions between player actions and platforms.
- Tested **color platform** behavior at different levels to ensure it works well with existing mechanics.

Week-9:

- Tested the game and check bugs for each level
- Changed the difficulty for the levels
- Add the **dashing** feature as a secondary movement mechanic.
- Add level 4 to test the **dashing** mechanic.
- Implemented the trap reset functions to **level4** so the player can reset the character after dropping inside the bridge.

Week-10:

- Added a limit to the number of flips allowed per level
- Changed the color of the destination so players don't confuse it as a trap
- Updated and added more HelpTexts
- Added level progression indications to each level
- Added analytical tracking
- Restart level button has been added

Week-11:

- Resigned the level 3 by adding the camera follow function and extended the map in general.
- Updated level transitions and added new instructive texts
- Changed the destination shape to a flag
- Added firebase metric collection for WebGL build
- Bug fixed player falling off the world

Week-12:

- Resigned level 3 to make it less difficult.
- Combined level4 with level2 to improve tutorial lessons.
- Fixed background color bug for Restart Button.
- Modified level reset functionality on hitting a trap.
- Added Pulse Animation to Flips and Restart buttons in tutorial level.
- Added Level Manager Scene to go to a particular level.

Week-13:

- Updated the Metric analysis and the graphs related to the data.
- Updated level3 in three parts, adding the moving traps in this level both vertically and horizontally.
- Created the moving platforms to let the user have more than one way to achieve the next part/destination.

- Updated level1 and level2 design to be more concise so that users will have better experience to understand how the game works.
- Extended all three levels to make the map wider than previous versions.
- Created Menu function and introduced level0 as the text tutorial section.

Week-14:

- Added a new level - Level 4, which had more exciting challenges and implementation of game mechanics.
- Changed level3 first black wall and removed the white edge. Extended the distance for final flag, changed the Victory text position and font
- Fixed issues for the player not sticking with the moving platform.
- Fixed a bug with the WebGL build not uploading metrics
- Fixed the bugs for shaking issues. Changed the dash distance and added the J and K keys.

Week-15:

- Extend level 2 and level 3 to incorporate feedback changes
- Implemented changes to level 2, 3 and 4 to maintain a balance to the level of difficulty.
- Added audio, Added checkpoints
- Fixed progression issues with the color swapper
- Fixed the slope fraction issue. Updated the code for generating analytics graphs.
- Updated UI for all the levels

Weekly Progress

List the individual work done by each team member up to that week in the table below. Add short descriptions of the work done and add a link to one relevant Github commit for the respective work done by that team member.

Week Number	Team Member	
Week 8	Andre Lebecki	Tianlan Yang
	Researched similar mechanics	Research different game, generate ideas about twist, Test color based platform in various levels and states
	Riya Ranjan	Siddhi Singh

	Researched different game genres and twist	Researched couple of games, worked on game mechanics
	Shih-Ju Hsu	Khushi Naik
	Researched games and mechanisms	Researched games with similar tropes and mechanics
Week 9	Andre Lebecki	Tianlan Yang
	Worked on setting up GitHub repo & GitHub page	Start designing level 4, especially the dash functions availability.
	Riya Ranjan	Siddhi Singh
	Game flow diagram, explored trap enhancements	Explored future advancements, worked on level 1
	Shih-Ju Hsu	Khushi Naik
	Tested the game and implemented dashing mechanism	Researched future mechanics advancements
Week 10	Andre Lebecki	Tianlan Yang
	Set up task tracking Refactored to be based on prefabs Added analytics tracking https://github.com/CSCI-526/csci526-fall24-friday-main-hue-crew/commit/739142665f6247b417a53121f09317ee6de87474	Solve the overlapping problem for obstacles in all four levels, and the base of obstacles in seen in both backgrounds https://github.com/CSCI-526/csci526-fall24-friday-main-hue-crew/pull/2/commits
	Riya Ranjan	Siddhi Singh
	Helped with assigning tasks, HelpText Bug fix, set up Restart Level button to restart each level https://github.com/CSCI-526/csci526-fall24-friday-main-hue-crew/pull/3/commits	Worked on the help text time limit, Improved and added game instructions to make the game more clear to the player. Bug fixes. https://github.com/CSCI-526/csci526-fall24-friday-main-hue-crew/pull/5/commits

	Shih-Ju Hsu	Khushi Naik
	<p>Implemented a UI feature that displays the corresponding level number for each level, Wrote scripts for generating metric graphs</p> <p>https://github.com/CSCI-526/csci526-fall24-friday-main-hue-crew/commit/40571548d20be735bb54b0bce59c37cc2334c020</p>	<p>Implemented the script and UI to limit the number of flips allowed per level, Updated the destination color, Updated HelpText UI</p> <p>https://github.com/CSCI-526/csci526-fall24-friday-main-hue-crew/commit/6a26836cf84fd5cd42e04ac60f3a1d2b67e4e4b9</p>

Note: This is to be followed for the rest of the semester. Make sure it is updated each week.

Week Number	Team Member	
Week 11	Andre Lebecki	Tianlan Yang
	<p>Fixed player falling off the world by moving off screen Added firebase database metric collection</p> <p>https://github.com/CSCI-526/csci526-fall24-friday-main-hue-crew/commit/2bcc5bc923ba0383311c1b2df8ea41ed2d0ec621</p>	<p>Redesigned the level3; Extended the ground and background length; Added the camera follow function; Added more obstacles and traps to make the level duration longer.</p> <p>https://github.com/CSCI-526/csci526-fall24-friday-main-hue-crew/commit/003d45f7a3a58bb5409e85160be5c6da8abc30b9</p>
	Riya Ranjan	Siddhi Singh
	<p>Changed destination to a flag and created prefabs for the same, still working on trap enhancements</p> <p>https://github.com/CSCI-526/csci526-fall24-friday-main-hue-crew/commit/a8a2b30f59f1786a5d8fdc365cda5e7b7669</p>	<p>Fixed help text bugs, working on tutorial levels</p> <p>https://github.com/CSCI-526/csci526-fall24-friday-main-hue-crew/commit/dea576321dd68de2cb5517aae3141f63fba</p>

	0ce1	601cf
	Shih-Ju Hsu	Khushi Naik
	<p>Fixed the dashing bugs that players are able to pass obstacles or traps.</p> <p>Researched how to access data from firebase for displaying graphs.</p> <p>https://github.com/CSCI-526/csci526-fall24-friday-main-cs</p> <p>https://github.com/CSCI-526/csci526-fall24-friday-main-Unity-Template/commit/99bf1c40a6f0325ad9886d5da46f6f0e4329c262</p>	<p>Updated level transitions script and UI, Added new instructive texts</p> <p>https://github.com/CSCI-526/csci526-fall24-friday-main-hu</p> <p>https://github.com/CSCI-526/csci526-fall24-friday-main-hu/commit/2f2bdc7f5bfc4f4b9fdcd3e64d70a74e4396fb81</p>
Week 12	Andre Lebecki	Tianlan Yang
	<p>Level 1 Design Addons</p> <p>Moved spike tutorial</p> <p>Made the build</p> <p>https://github.com/CSCI-526/csci526-fall24-friday-main-hu</p> <p>https://github.com/CSCI-526/csci526-fall24-friday-main-hu/commit/07b1dce8491075fbf5898e9132fa8a88950ac101</p>	<p>Level 4 system design(Combine to level2);</p> <p>Making level3 less difficult;</p> <p>Fixing the camera follow function exceed the screen</p> <p>https://github.com/CSCI-526/csci526-fall24-friday-main-hu</p> <p>https://github.com/CSCI-526/csci526-fall24-friday-main-hu/commit/c0922dd3ae7a1e8e95603518348903641bf1f318</p>
	Riya Ranjan	Siddhi Singh
	<p>Modified functionality to reset level, background color and flip count on hitting a trap.</p> <p>Bug fix for Restart button</p> <p>https://github.com/CSCI-526/csci526-fall24-friday-main-hu</p> <p>https://github.com/CSCI-526/csci526-fall24-friday-main-hu/pull/25/commits</p>	<p>Worked on tutorial level,</p> <p>Made the help text dynamic to change color based on background</p> <p>https://github.com/CSCI-526/csci526-fall24-friday-main-hu</p> <p>https://github.com/CSCI-526/csci526-fall24-friday-main-hu/commit/6be91dd890e6375e76f028f682e11b0678dfba9f</p>
	Shih-Ju Hsu	Khushi Naik
	<p>Fixed the bugs for double jumping when players touch obstacles</p> <p>https://github.com/CSCI-526/csci526-fall24-friday-main-hu</p>	<p>Added Pulse Animation in tutorial level, Added Level Manager, Updated UI</p> <p>https://github.com/CSCI-526/csci526-fall24-friday-main-hu</p>

	e-crew/commit/c4e40ad3faf693ef0e999cb1bcdee4a71bf29ad1	e-crew/commit/a4cdc9714096a4cfffc2ad3ea49e9435f15a100
Week 13	Andre Lebecki	Tianlan Yang
	<p>Updated metric manager to push to firebase using Unity Web Requests</p> <p>Added new location metrics for player deaths, swaps, and dashes</p> <p>Fixed collision jitter https://github.com/CSCI-526/csci526-fall24-friday-main-hu e-crew/commit/e127e8f1584cd9f9ae3489dc474b8f3e5853cd5d</p>	<p>Redesigned the level3 entirely, adding the moving traps, moving platforms. Designed more than one way to achieve the destination. Rendering and building the game in different build links in Github Pages and WebGL</p> <p>https://github.com/CSCI-526/csci526-fall24-friday-main-hu e-crew/commit/3faaafd4bdb92d080df818b18b2729294e6424b8</p>
	Riya Ranjan	Siddhi Singh
	<p>Changed UI for Level 1 and Level 2. Removed flip and restart button functionalities.</p> <p>https://github.com/CSCI-526/csci526-fall24-friday-main-hu e-crew/pull/54/commits</p>	<p>Changed the UI of all levels to improve the understanding, added text to help players understand if they hit a trap.</p> <p>Researched on future development ideas.</p> <p>https://github.com/CSCI-526/csci526-fall24-friday-main-hu e-crew/commit/e9e42bd4db3bfefe4ee6c480b5d6939df55e0be4</p>
	Shih-Ju Hsu	Khushi Naik
	<p>Fixed the bugs for player movement and obstacles.</p> <p>Adjusted the dash movement.</p> <p>Processed the data and generated the diagrams for analytics</p> <p>https://github.com/CSCI-526/csci-526-fall24-friday-main-cs csci526-fall24-friday-main-Unity</p>	<p>Updated UI and canvas scaling for all the levels to fit the game screen across all resolutions.</p> <p>Worked on Scripts for the Instruction texts, Added Instruction scene, Added Menu Selection scene, Redesigned Level 2</p>

	Template/commit/9d214e491cec06ebd2b10c325ceadd9dff81bb8e	https://github.com/CSCI-526/csci526-fall24-friday-main-hu-e-crew/commit/308268828ad77f741947f8dd9c446646213f9a1a
Week 14	Andre Lebecki	Tianlan Yang
	Fixed a bug with the WebGL build not uploading metrics https://github.com/CSCI-526/csci526-fall24-friday-main-hu-e-crew/commit/b34ce742852f5d33be5eb8a380bffe5bb058b50	Changed level3 first black wall and remove the white edge as well, add distance for final flag, also change the Victory text position and font; Build the Gold Progress Build. https://github.com/CSCI-526/csci526-fall24-friday-main-hu-e-crew/commit/24f50e5d11b8806f1540ea796e110ba3a02ab84a
	Riya Ranjan	Siddhi Singh
	Improved level 4 design and made bug fixes. https://github.com/CSCI-526/csci526-fall24-friday-main-hu-e-crew/pull/68/commits/d39a4614b4b8b40ce7851c06e7b7b7106aa7f3b3	Worked on level design of level 4. Fixed bugs. Incorporated feedback changes. https://github.com/CSCI-526/csci526-fall24-friday-main-hu-e-crew/commit/117c2ae0d395c5d505d8625bdc1464e93759ffb1
	Shih-Ju Hsu	Khushi Naik
	Fixed the bugs for shaking issues. Changed the dash distance and added the J and K keys. https://github.com/CSCI-526/csci526-fall24-friday-main-hu-e-crew/commit/2b3048f0c06de0a3a8e971378bf97e647c409c3e	Designed some parts of Level 4, Bug fixes, Implemented creative Ideas for level 4 https://github.com/CSCI-526/csci526-fall24-friday-main-hu-e-crew/commit/d8b05c9b09c15ac8c2ec4d0976657796497d5bed

Week 15	Andre Lebecki	Tianlan Yang
	Added audio Added checkpoints Fixed progression issues with the color swapper https://github.com/CSCI-526/csci526-fall24-friday-main-hue-crew/commit/6992a85dc74b09ee247cf9aa7aced5781c71519b	Fixing the player not moving with platforms issue; Build the Game. https://github.com/CSCI-526/csci526-fall24-friday-main-hue-crew/commit/553359f18441c04fe96b7c0d5b8c0e46175c3cb3
	Riya Ranjan	Siddhi Singh
	Improved and extended level 4 game design. Included changes from Beta survey feedback and fixed bugs. https://github.com/CSCI-526/csci526-fall24-friday-main-hue-crew/pull/70/commits/0569417707d73157cb93027629a824f7cd6e7e2d	Extended level design of level 2 and 3 while incorporating the changes mentioned in the feedback. https://github.com/CSCI-526/csci526-fall24-friday-main-hue-crew/commit/43fa92c447263a7952844d8fa439f06d64c42245

Major issue from the Alpha feedback:

Issue: Players are confused when they run out of flip counts and sometimes they don't know what to do next.

Solution: One solution is to display a text saying you have exhausted your flip limit and you need to restart the game. But later on in the development, we realized that it is not very efficient to use this method and the flip count doesn't really complement our game logic and we decided to exclude this logic altogether from our game.

Screenshot of changes:

LEVEL 1:

Alpha:



Use ARROW keys to move



Beta: Different and concise help text display, introduction to traps, menu button added

Menu



[<--] [-->] Press [C]

Press [SPACE]

Gold: Checkpoints added

Menu



Press [SPACE]

Checkpoint

Press [SPACE]

LEVEL 2:

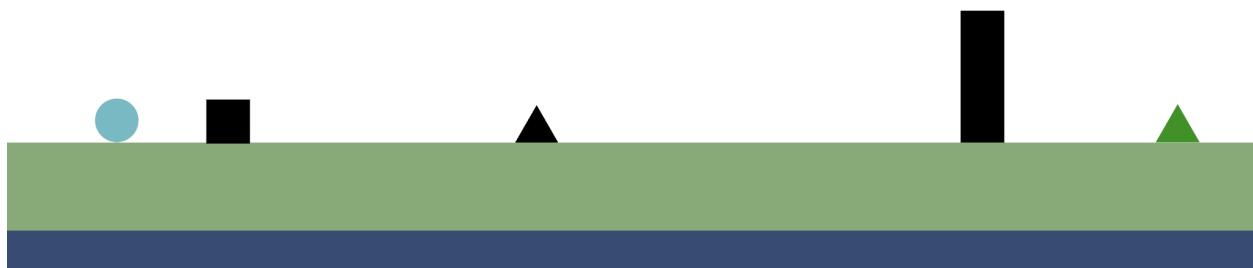
Alpha:



Flips: 0 / 5

Level 2

Restart



Beta: Introduction to hidden paths, efficient help text display

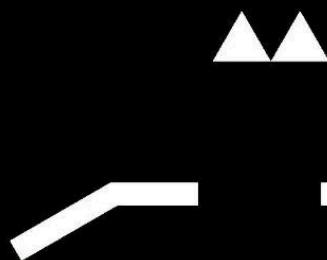
Menu



Press [SPACE + C]

Gold:

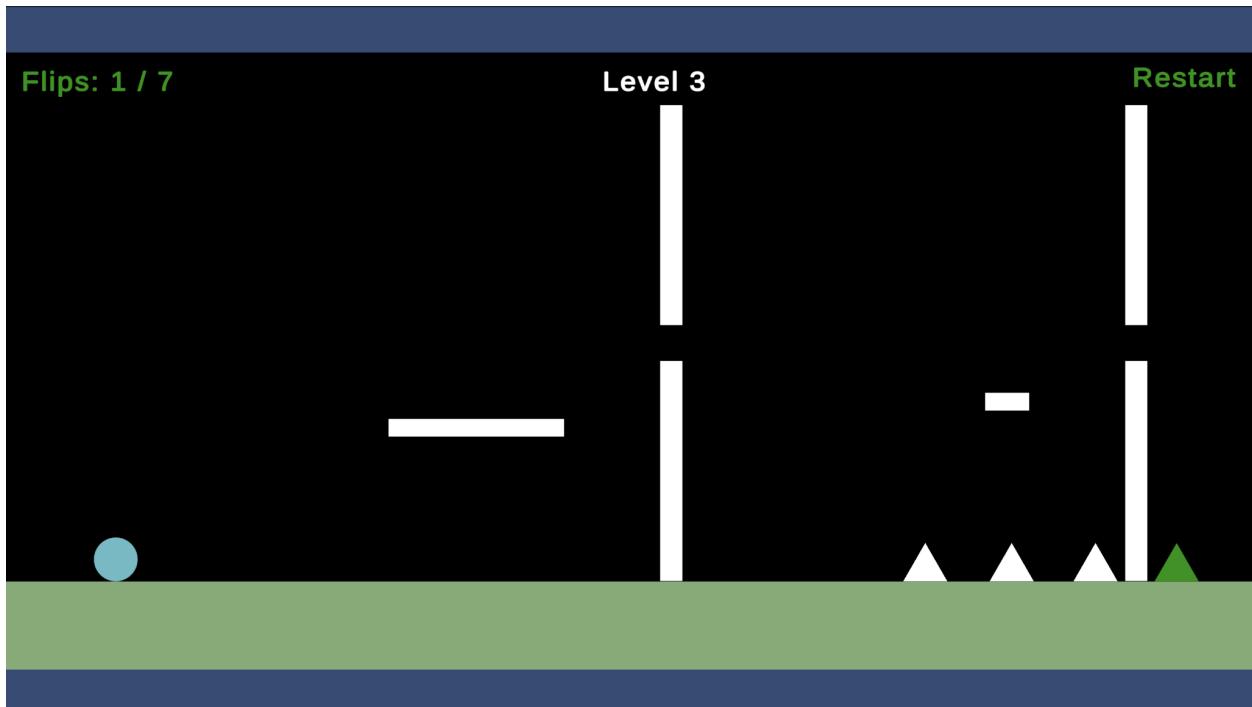
Menu



Press [V]

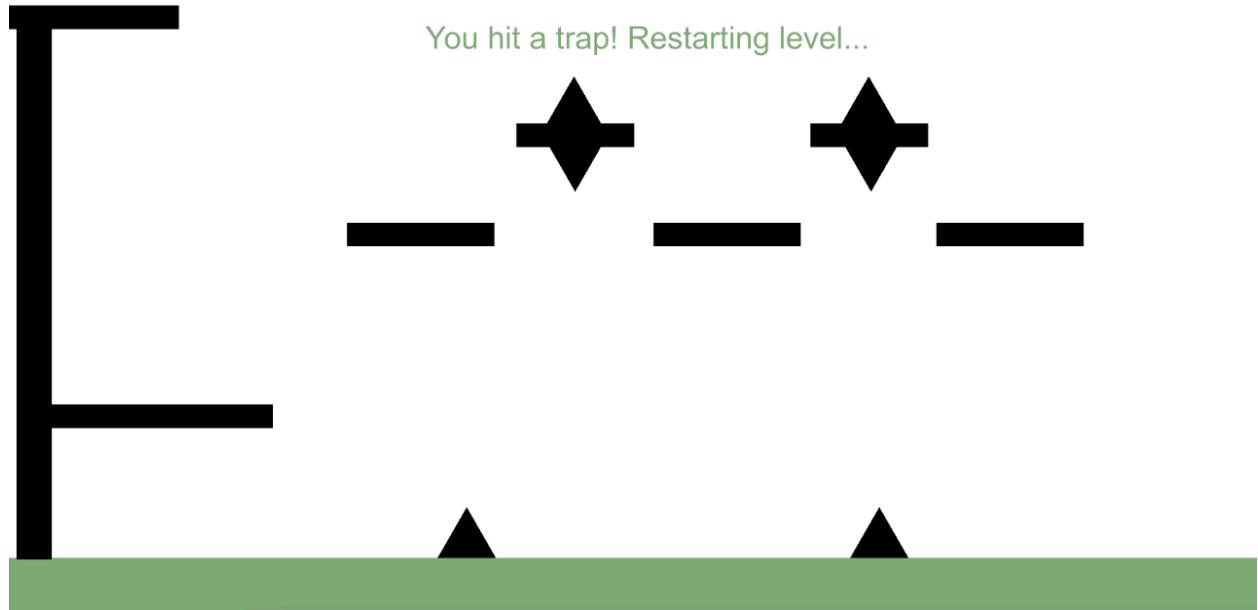
LEVEL 3:

Alpha:

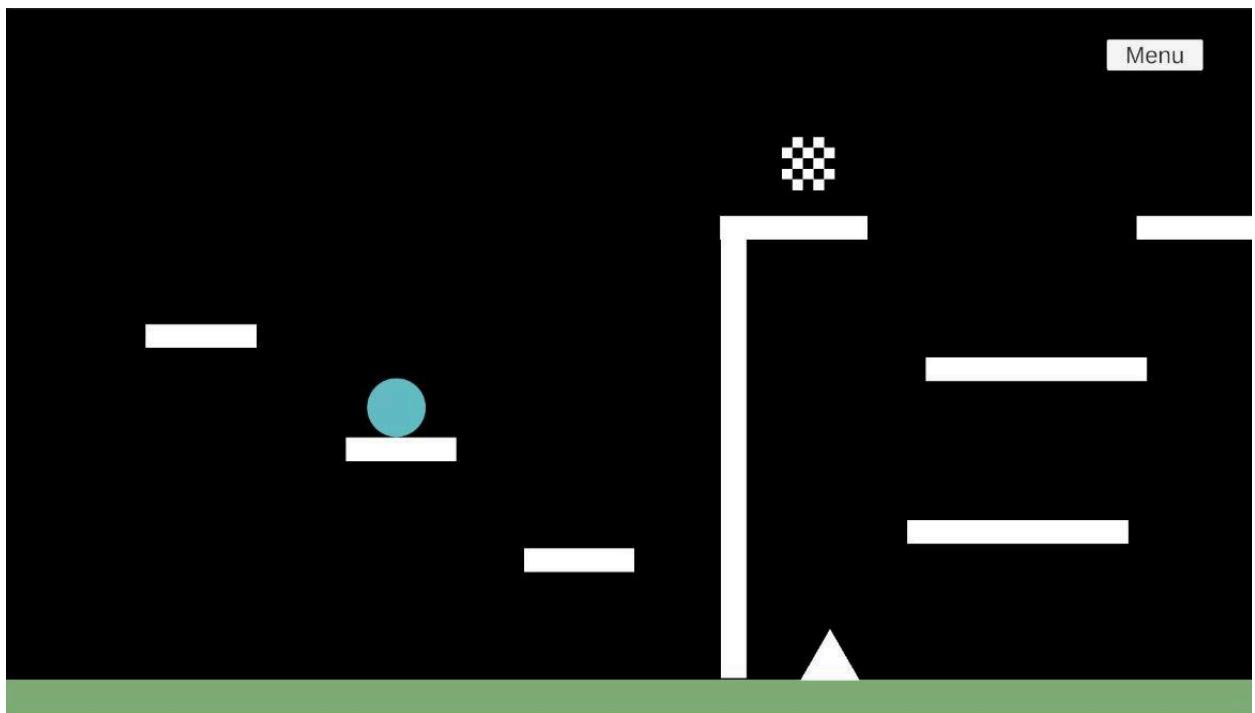


Beta: Introduction to moving traps and moving platforms, efficient descriptive texts added

Menu

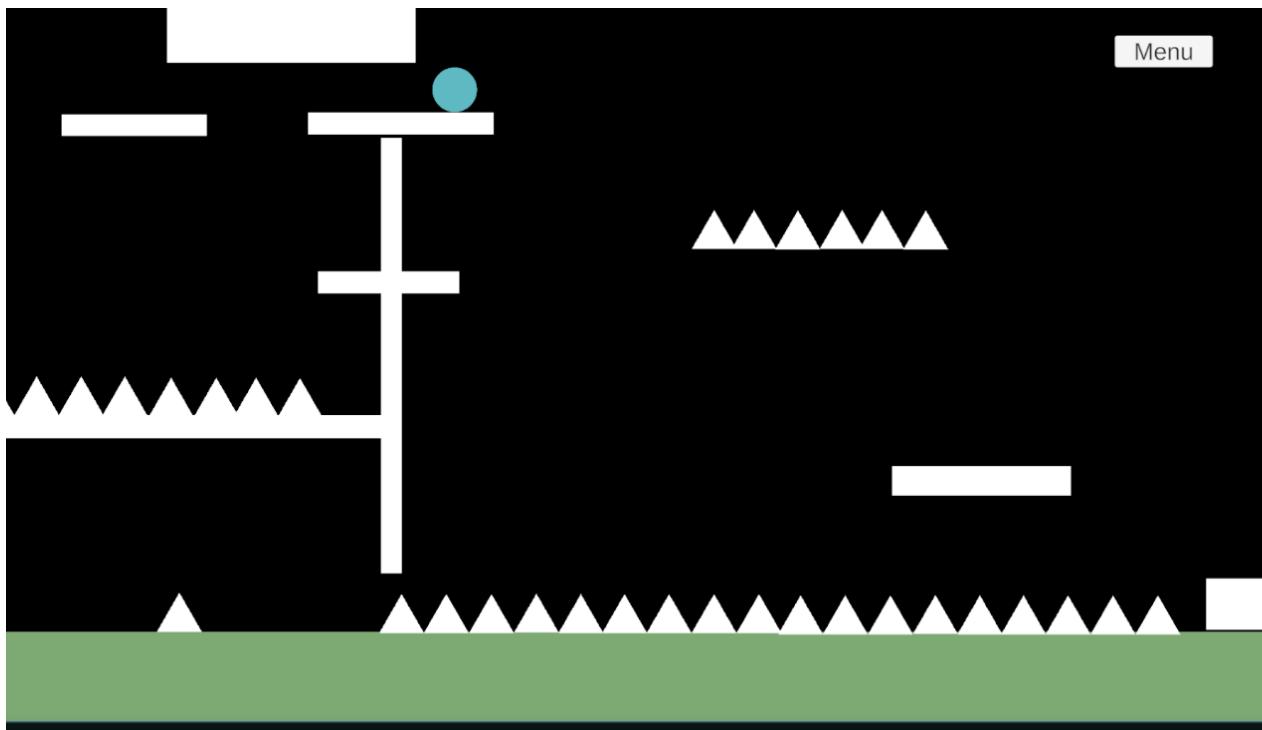


Gold:



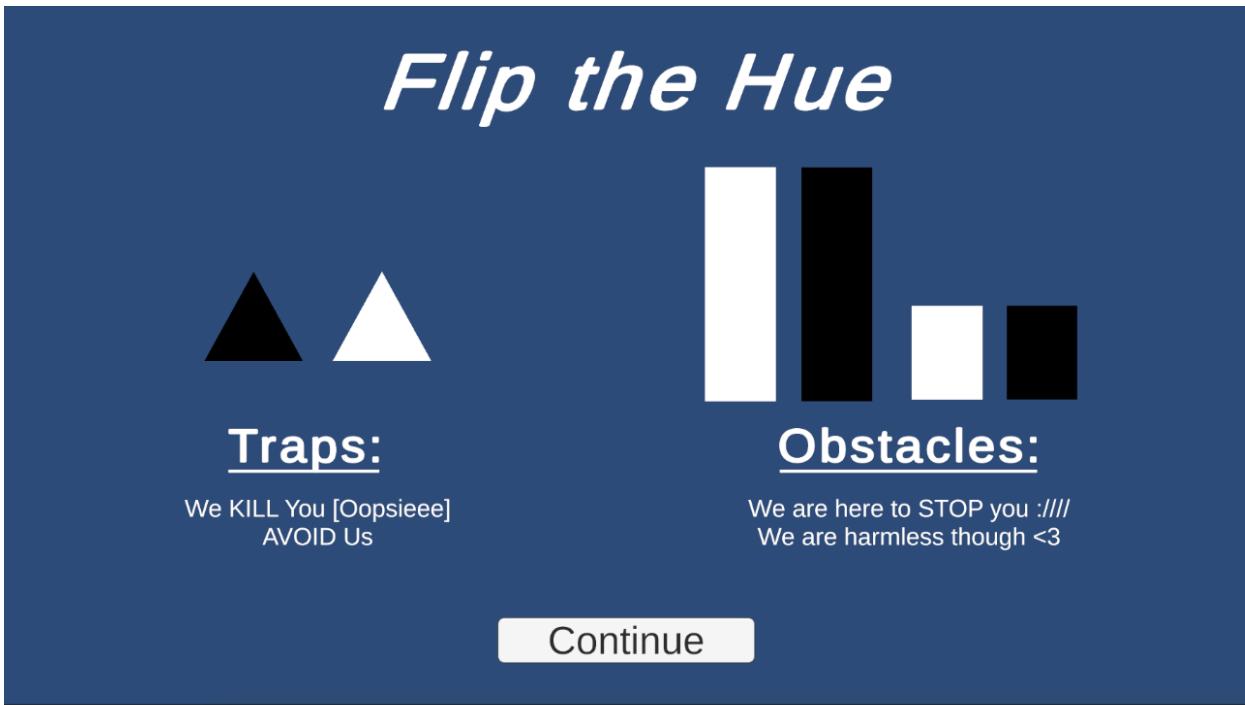
LEVEL 4:

Gold:

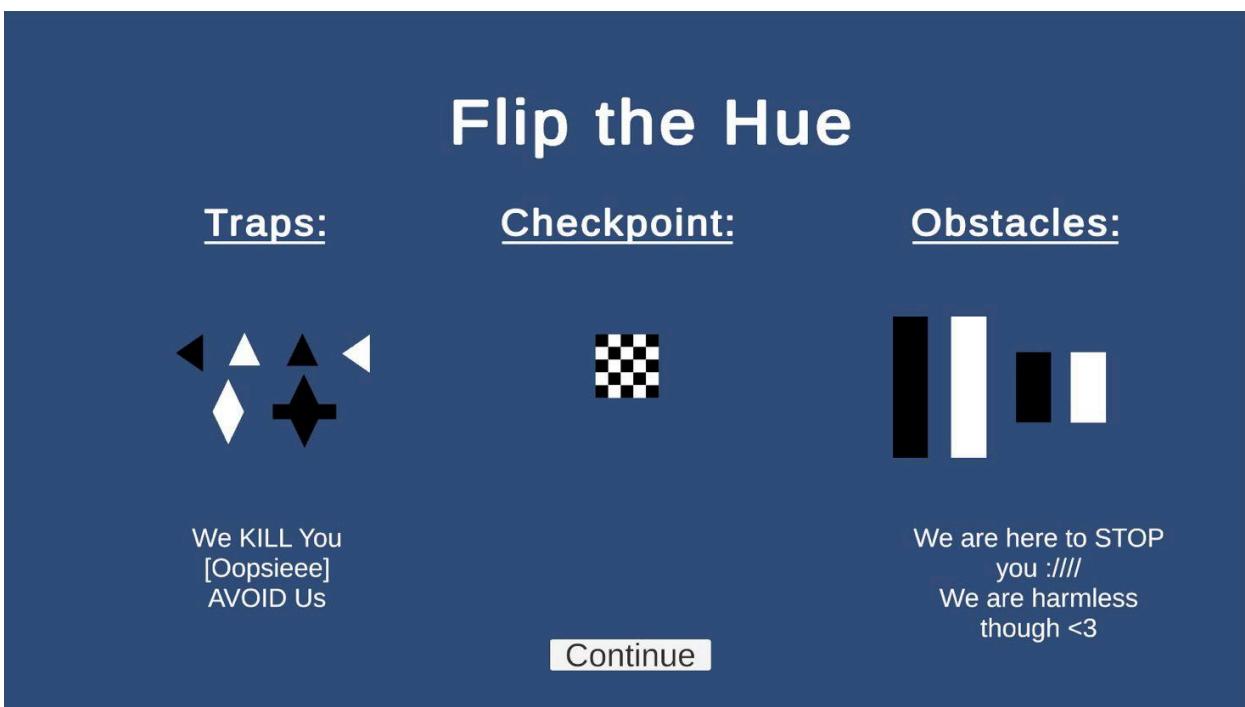


INSTRUCTIONS SCREEN:

Beta:

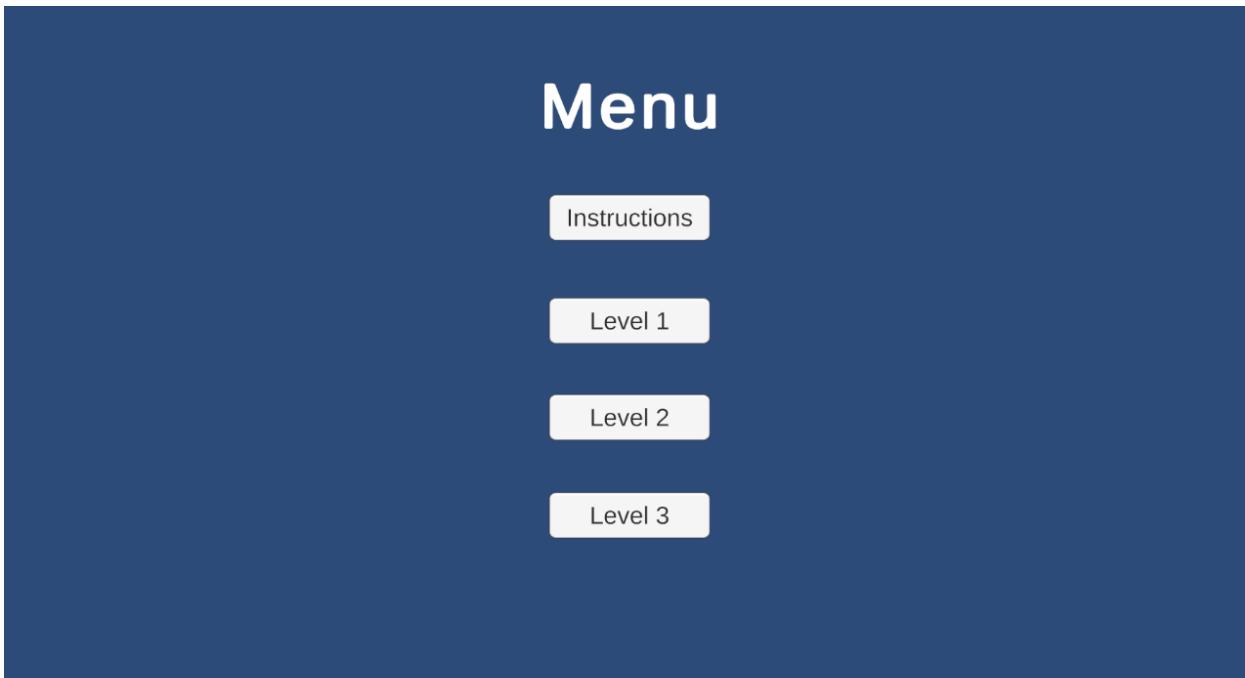


Gold:

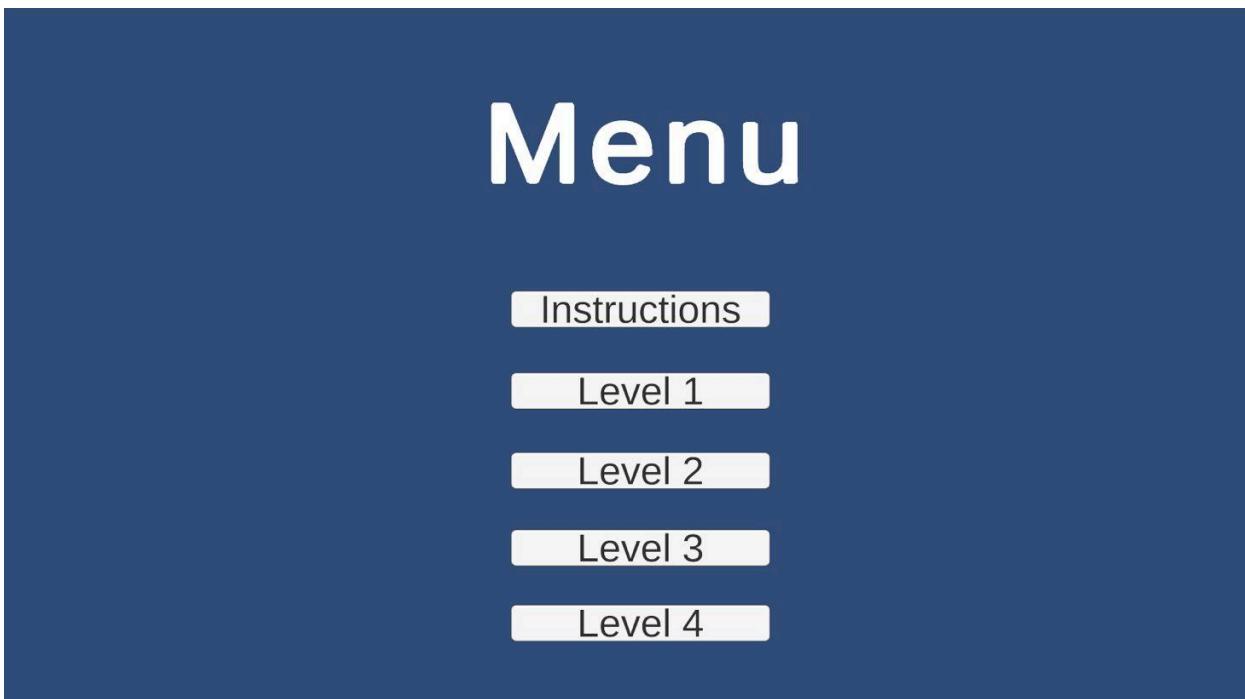


MENU SCREEN:

Beta:



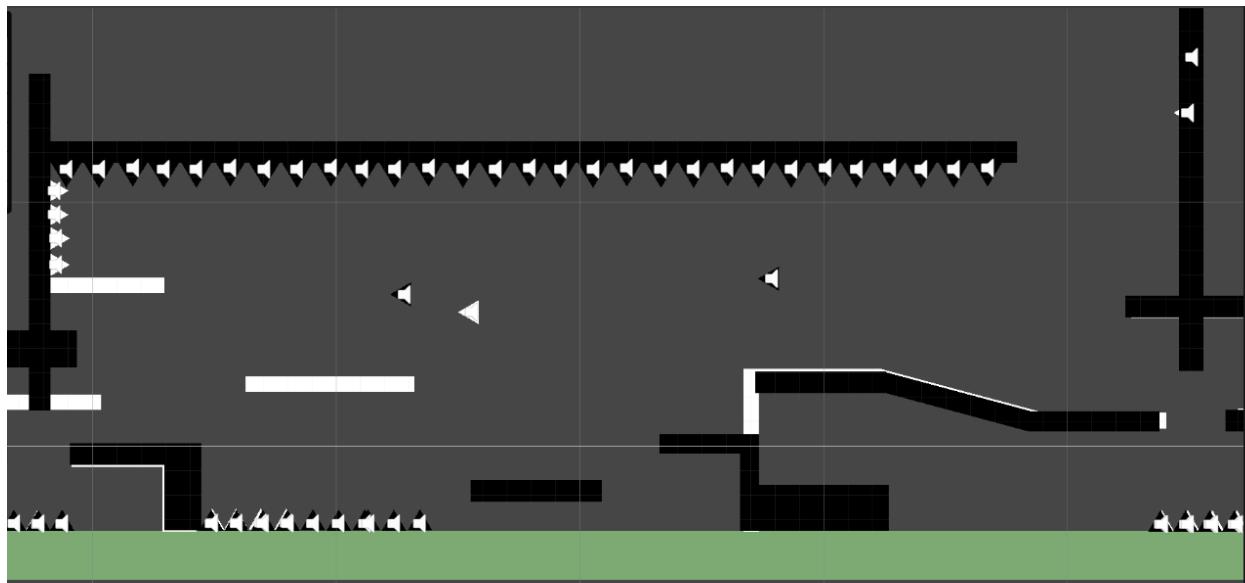
Gold:



SOUND EFFECTS:

Audio effects were added to enhance the user experience, as part of Gold build.

Gold:



Review Notes

[Playtest 1 10/18/2024]

Feedback:

- Instructions were disappearing too soon for playtesters to follow.
- Confused about the jumping function as some places' jump feature was available and then suddenly it wasn't. (level 2)
- Confused between traps and destination. Not clear on distinction between the two.
- No validation that they progressed the level. It was not clear that they hit the trap and restarted level. (level 2)
- It wasn't clear to the playtester which level they were on.

[Playtest 2 10/25/2024]

Staff feedback:

- Messages disappears too fast when player moving fast
- Player was not understanding when they hit a trap
- Level 3 can be passed without switching
- Taking time on Level 2 with Color and obstacle
- After flips exhausted player doesn't know what to do
- Number of flips not enough on level 2
- Text prompts are not efficient
- No idea why restarted so trap needs to be specified and text to show you hit a trap
- Usage of flips does not feel natural, player is confused
- Player is not sure when to flip in Level 3 to see the platform

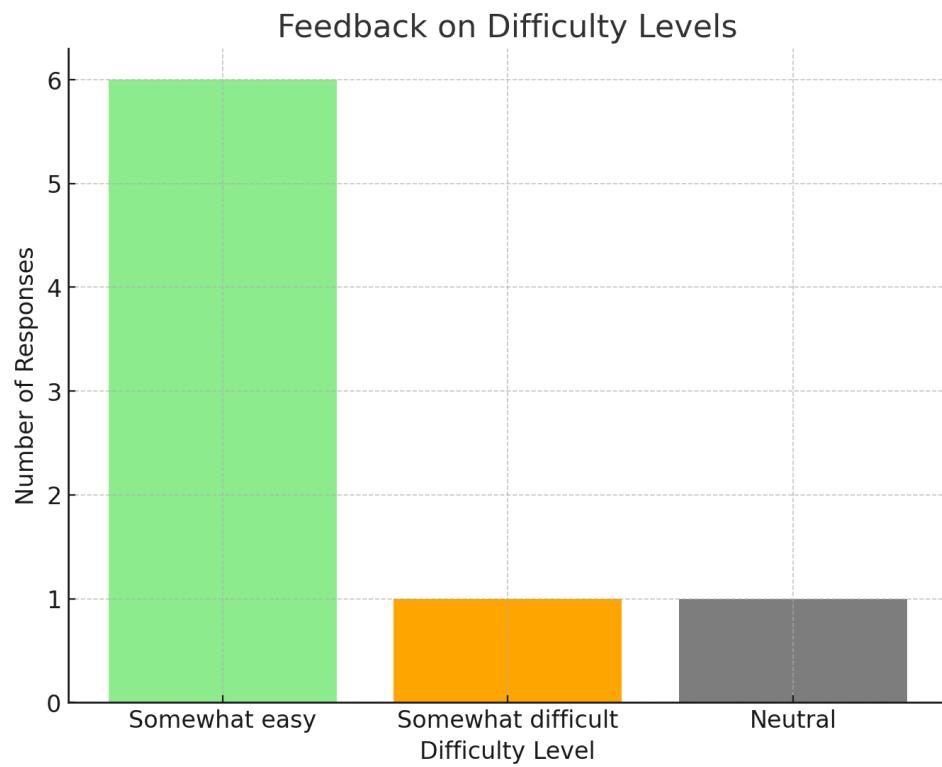
Team Member	Feedback
Singularity Studios:	<ul style="list-style-type: none"> ● Double jump bug on Level 1 ● Player doesn't know when they hit trap as there is no indication ● Confused at level 3, player always goes ahead, didn't realize the white platform on top ● Thought bar killed at level 3 when it was a trap ● Don't know what to do once flip limit reached ● After 2 mins realized the platform on top and how to time the jump ● No message when flip limit reached ● Dash message displayed very early
The Nightmare Studios:	<ul style="list-style-type: none"> ● In level 1 switch color again is not clear ● Player doesn't know when hit by a trap ● Cannot figure out timing to reach platform white in level 3 ● Restart button shortcut? ● Players now aware that flip is exhausted ● Player found Flips count limit not sufficient in Level 3

[Staff Feedback] - Alpha Progress Check

- For a new player it is difficult to understand how to move ahead in the game sometimes
- Number of flip limits is not enough for Level 3
- Player is confused if they hit the trap

[Alpha Survey Feedback]

1. How easy was it for you to learn how to play the game?



Conclusion: We should add more challenging steps in the easier level and try to improve the understanding of difficult levels.

2. Describe the objective of the game in your own words/interpretations.

Playtester 1: Change the background color to navigate the course to the finish flag and dodge obstacles along the course

Playtester 2: Use the C and arrow keys to control the character and map, and try to reach to the end.

Playtester 3: The objective of the game is to reach the green triangle by jumping over the obstacles, avoid the triangles, and flip the color to get past.

Playtester 4: Let the ball pass through the level.

Playtester 5: change between two different terrains to reach end

Playtester 6: it is a 2d platformer game that controls the player to reach green goal with actions like flip, jump

Playtester 7: The objective of the game is to progress the storyline or complete levels by solving puzzles, using black-and-white scene switching to reach the goal

Conclusion: Most of the players easily understood the objective of the game.

3. What are some of the enjoyable aspects of the game so far? (What would you like to see more of)

Playtester 1: I like that the game challenges the player to perfect the background changing time to either jump onto a platform or dodges the obstacles.

Playtester 2: I think I can use the C key to change the different maps is cool!

Playtester 3: It's very creative and challenging as the level advances. I love the concept and simple mechanics.

Playtester 4: Changing the color to pass the levels is an original way of playing for me.

Playtester 5: It is simple but fun to play. Learning is easy and accomplishments can be fulfilled quickly

Playtester 6: The beginner level is simple and straightforward.

Playtester 7: The current number of levels is too few, I hope to develop more levels and more decryption methods

Conclusion : Players enjoy the creative color-changing mechanic of the game. Some of them find it fun to play with an easy learning curve. They would love to see more levels, challenges and features that are more engaging.

4. Describe any unclear or frustrating parts of the game.

Playtester 1: "Without the UI text I have no idea the triangle would be a trap I should avoid, since it has the same shape as the finish flag. Also I found out some bugs during the game:

1. In the beginning of the game, if I go left, I could never come back
2. In level 4, if I just keep pressing V, I can squeeze through the hole under and go to the end."

Playtester 2: Actually, I don't know how to complete level 3... I don't know whether it is too difficult or just because I'm not good at playing games.

Playtester 3: I can move all the way to the left or right and my player would disappear forever. For level 2, sometimes I'm not sure if I died to advance to the next level. I know there's a level 2 on the top, but I think it's a bit confusing when I first played it.

Playtester 4: None

Playtester 5: The destination was in the same shape of obstacle, which is not very clear

Playtester 6: I think the design of the later levels is a bit strange, some levels can be passed without flipping. And I think the gravity parameters of the game are wrong, the game feels like it is in space.

Playtester 7: I think everything is great, I really like this game

Conclusion : Players are confused between traps, destination and obstacles and find some bugs. Players are confused when they hit the trap in level 2 and find it difficult to clear the level 3.

5. What improvements would you like to see?

Playtester 1: Have moving platforms or moving obstacles, maybe even add some music to turn the game into a rhythm puzzle game!

Playtester 2: I think overall the game is perfect!

Playtester 3: Fix the left and right boundary. Make dying and restart a bit clearer.

Playtester 4: Look forward to seeing more challenging levels.

Playtester 5: Adding more challenging levels and different obstacles.

Playtester 6: Optimize level design

Playtester 7: Expressing the hope for improvements in puzzle diversity, black and white scene switching mechanisms, etc., to make the gaming experience more rich and interesting.

Conclusion : Players would like to see moving platforms, challenging levels and audio. Bugs should be fixed. Players want the level design to be more optimized.

[Playtest 3 11/08/2024]

Staff feedback:

- Ball is shaking when it interacts with obstacles
- The camera is not following the player correctly
- For a new player it is difficult to understand and complete the level 3
- Analytics not working properly
- Menu button is not present
- Levels are not exploratory enough, fixed and single path to reach the destination
- Name of the game is not present on the Menu Screen
- Flip limit and restart button seems unnatural

Team Member	Feedback
Chefs:	<ul style="list-style-type: none">• Player is confused between traps and obstacles• In level 2, player is switching color and immediately getting hit by the trap, it is confusing• Level 2, dashing help text is not at the right place• Level 3 is difficult, not able to clear the first part
The Nightmare Studios:	<ul style="list-style-type: none">• Player can't jump when on top of obstacle• Dash is not helping sometimes• End of level stuck on the flag• No indication of game ending

[Playtest 4 11/22/2024]

Team Member	Feedback
Chefs:	<ul style="list-style-type: none"> Space +C didn't seem natural to playtester Playtester found difficulty with key alignment of "C" "V" and Space Playtester did not know that they can use dash mechanic to make long jumps In Level 3 the playtester couldn't understand how to reach topmost platform
Perversion:	<ul style="list-style-type: none"> Playtester found that movement was not smooth on slopes and on moving platforms Playtester was not able to do Space + C and move forward together Playtester mentioned having checkpoints would be helpful In Level 2 playtester found a bug when the scene does not restart after hitting a trap Playtester couldn't figure out how to clear first long jump challenge in level 3
Factor Fighter:	<ul style="list-style-type: none"> Playtester found Space + C and move forward to be difficult Playtester found dash "V" not useful Playtester wanted checkpoints in the hardest part of each level in the game

Hypothesized Issues from Feedback (Gold)

Hypothesized Issue #1

Dash functionality underused

Description

The dash is rarely utilized by players, with many completing levels without using this feature.

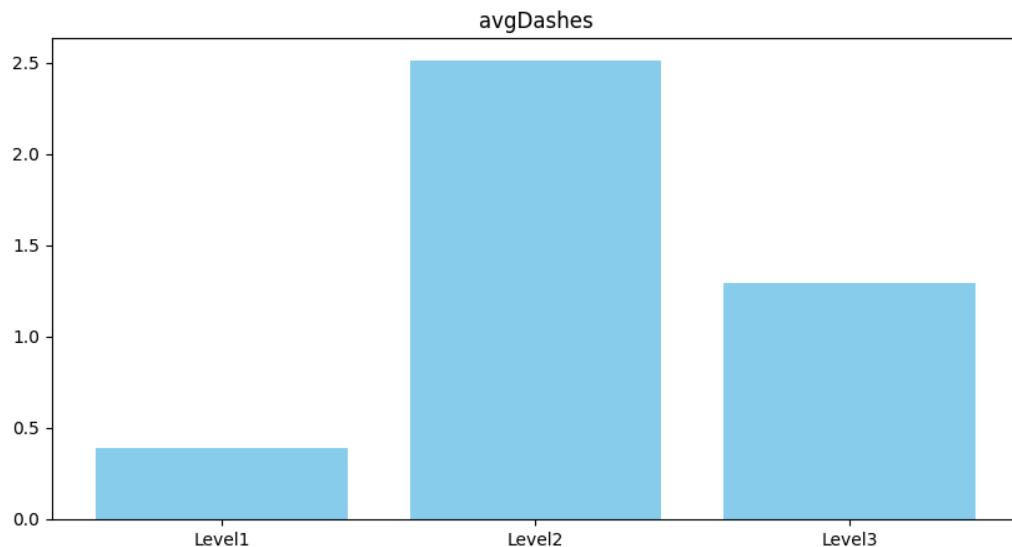
Significance

The underuse of the dash feature indicates that it may not be effectively integrated into the gameplay, potentially leading to a lack of player engagement and missed opportunities for dynamic gameplay.

Feedback/Data points

- Multiple players reported rarely using the dash feature after its tutorial, one player said " I never really used the dash ability at all after it was introduced."
- Another player noted, "I would love to see more level design that works with the dashing mechanic."
- Four players mentioned that they didn't use dashing after it was introduced.

Analytics Support



In metric #4, we found that the average number of dashes used in Level 3 is quite low. We expected players to use dashes more than twice to complete this level. This suggests that players can pass the level without relying on the dash mechanic.

Potential Fixes

1. Add challenges combining dash with other mechanics, such as mid-air flipping or avoiding moving traps.
2. Introduce tighter spaces or obstacles requiring dashing to progress.

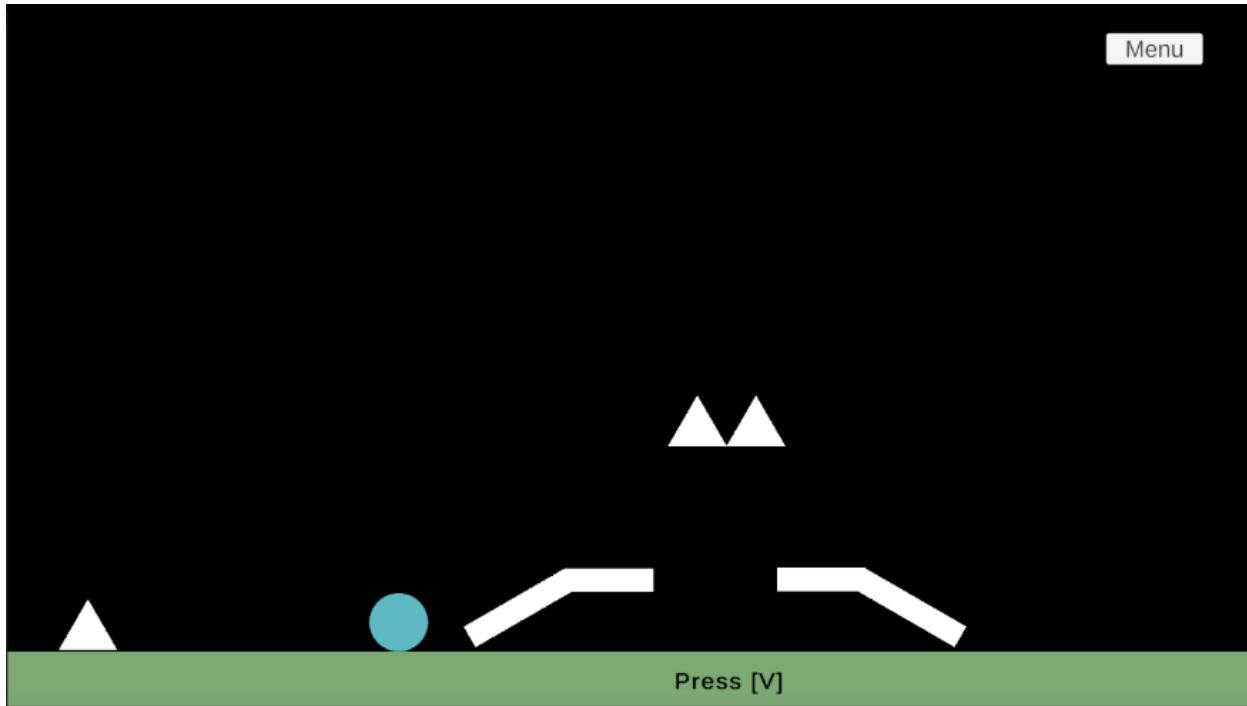
Implemented Solution

Earlier the dash functionality was used in Level 2 but now all the levels implement this functionality. Levels were redesigned to incorporate narrow spaces and obstacles that mandate dashing. Specific sections now combine dashing with other mechanics. We chose this solution because potential fix 1 could have confused the players more and with fix 2 the game became more interesting.

Testing Strategy

- Track dash usage per level to confirm increased usage.
- Collect player feedback on whether the dash mechanic feels more intuitive and necessary.

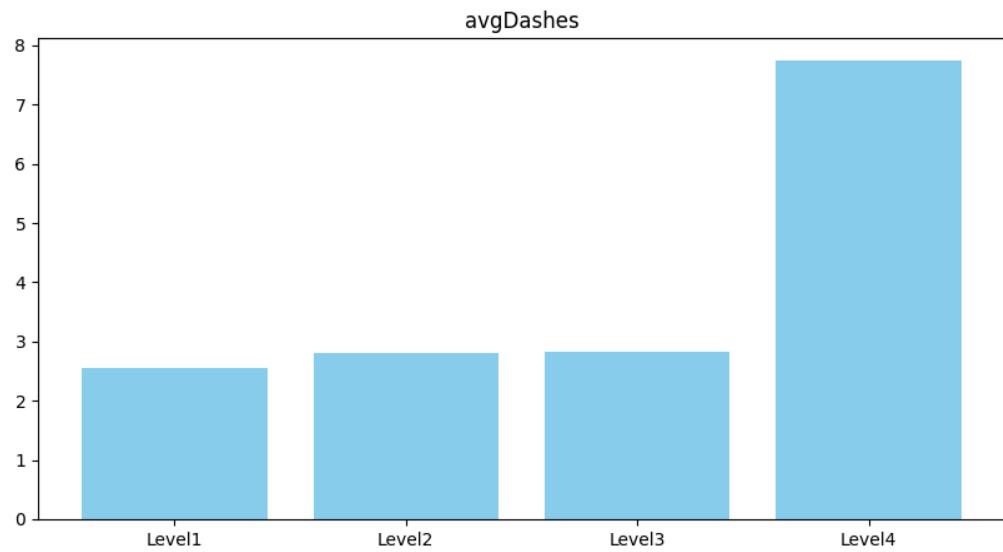
Before: Dash functionality was introduced only in level 2.



After: Narrow spaces built in level 3 and 4 which can't be passed without dashing.



The number of dashes used in each level increases.



Hypothesized Issue #2

Sloping Friction feels unintuitive and unnatural.

Description

Players experience unnatural physics when traversing slopes, which can lead to frustration and hinder progression.

Significance

Smooth traversal on slopes is essential for maintaining momentum and player immersion. If the slope mechanics create resistance or push the player back, it disrupts progression and leads to frustration.

Feedback/Data points

- Two players observed that the ball's movement on slopes felt unstable, describing it as "Shaking too much."
- One player mentioned that "The slope in the area where I can dash pushes me back, it's hard to go up the slope."

Analytics Support:

In metric #4, players tend to use dash to go up the slope in these two positions because of the friction on the slopes.



Potential Fixes

1. Rework environmental physics to address issues such as reducing the platform friction while the player is on the slope.
2. Make the obstacle walls on both colors more straightforward. Remove some unnecessary edges that might make users confused.

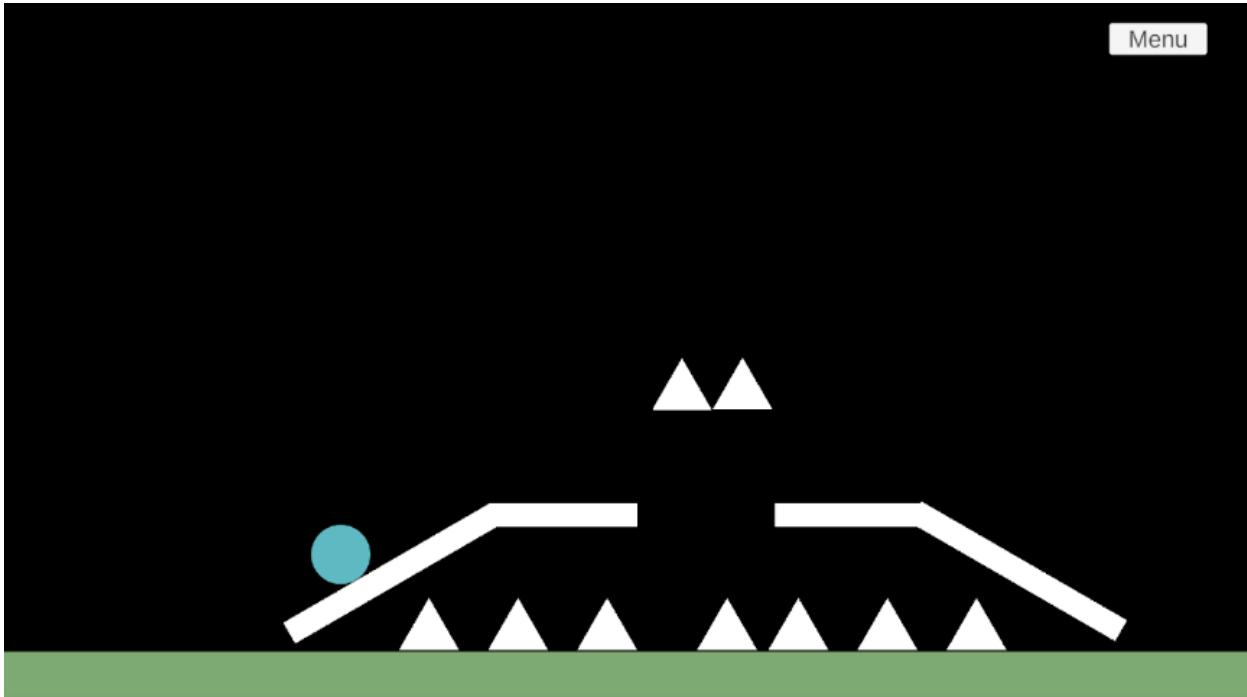
Implemented Solution

We adjusted the platform friction on the slope to provide more stability, preventing the player from being pushed back while attempting to ascend. Additionally, the interaction between dashing and slopes was refined to ensure consistent behavior during movement. We chose to fix the platform friction to provide the players with a smooth movement throughout the game.

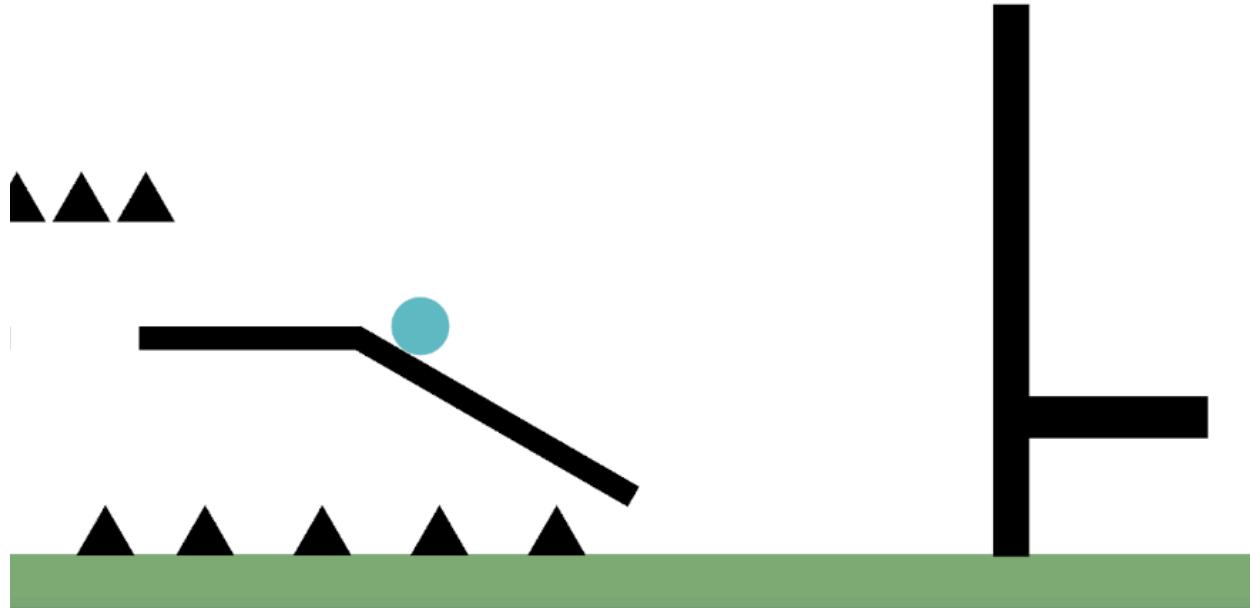
Testing Strategy

- Track the number of player deaths caused by platform-related issues before and after implementing friction adjustments. A significant reduction would indicate improved interactions.
- Collect player feedback on the new physics system.
- Test for edge cases, such as dashing while climbing the slope, to ensure consistent behavior across different scenarios.

Before: Ball had an unnatural friction while climbing up the slope.



After: Friction issue was fixed and now the ball has a smooth movement on the slope.



Hypothesized Issue #3

High Challenge Levels Lack Accessibility Features

Description:

Certain levels, particularly Level 3, increase in difficulty abruptly. There is a significant change between the difficulty level of level 2 and level 3.

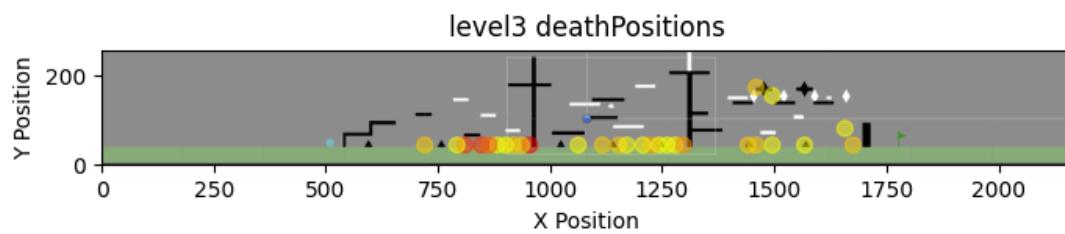
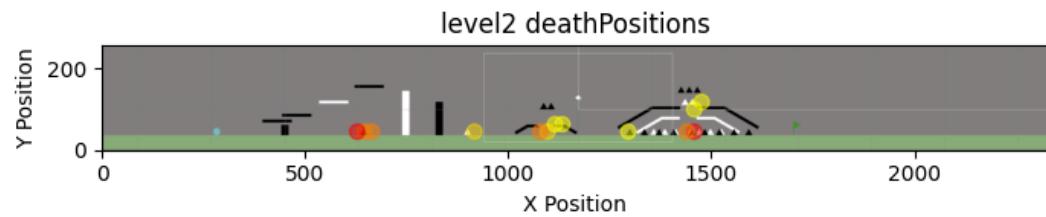
Significance

The difficulty increases randomly in certain levels, particularly in Level 3 where the players identified it as very challenging to complete. It leads them to frustration and in turn, their willingness to play the game reduces.

Feedback/Data points

- A player mentioned, "Level 3 is still too difficult compared to previous levels."
- Four players mentioned, "Adding checkpoints in a difficult level like Level 3 will increase my willingness to keep playing the game after I die."
- The use of multiple keys simultaneously ("C" + "SPACE") was very unintuitive and frustrating for some players.

Analytics Support



In metric #3, we observe that in Level 2, players tend to die at specific traps, which results in distinct clusters on the heatmap, with some areas showing concentrated deaths. In contrast, Level 3 exhibits a more evenly spread distribution of death positions across various traps. This indicates that players are encountering multiple challenges throughout the level, making it feel more difficult and leading to a higher overall distribution of deaths.

Potential Fixes

1. Add checkpoints in difficult/all levels to reduce the failure/death penalty
2. Adjust the difficulty progression to ensure a smoother transition between levels
3. Add simpler control schemes to make the game more intuitive

Implemented Solution

Checkpoints were introduced in all the levels which in turn will reduce the failure ratio and hopefully, the players will feel less frustration due to the game not restarting from the start point.

Additionally, made the instructions more intuitive in all the levels so that the players can understand to navigate properly without any confusion in the levels.

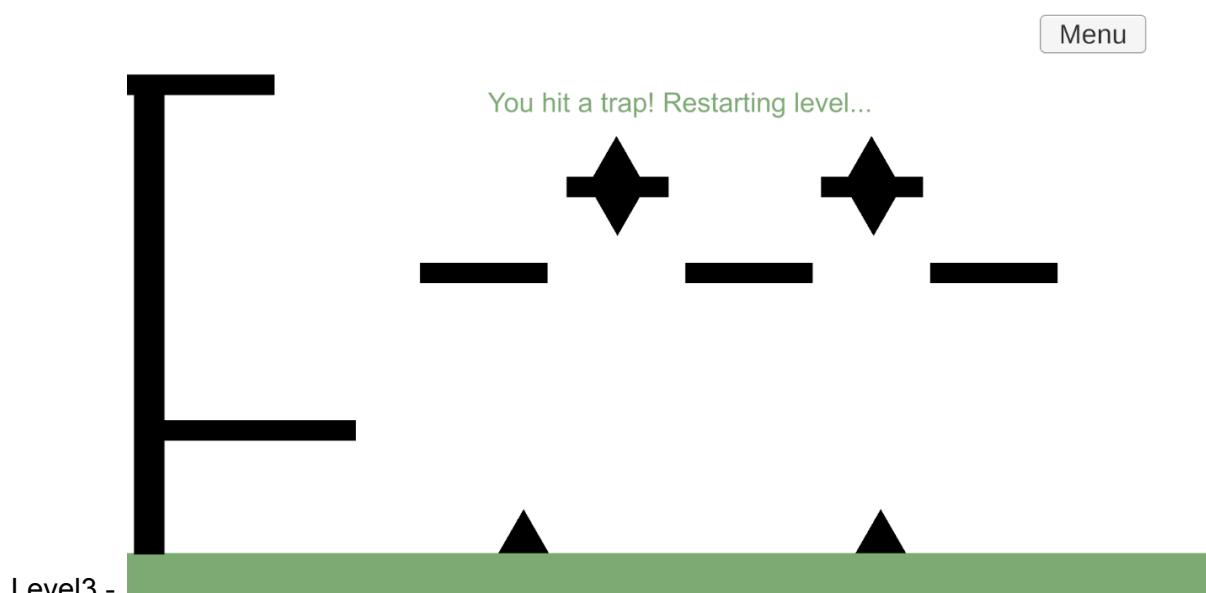
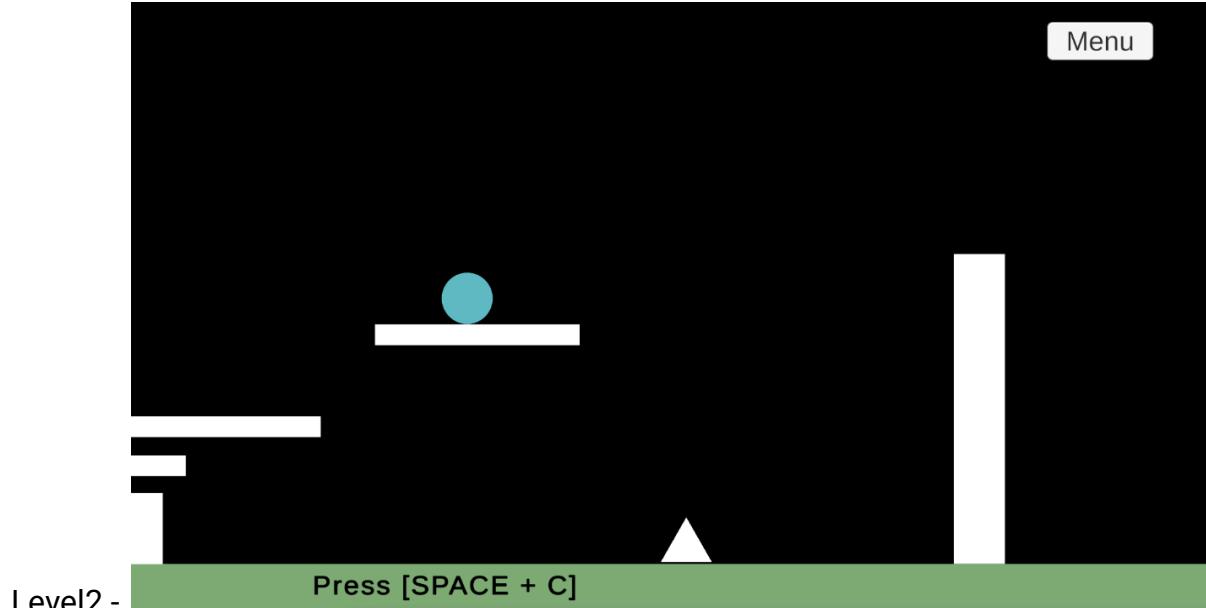
A new level was added to ensure that the difficulty curve is smoother and the level transitions don't feel overwhelming to the players.

We introduced checkpoints and difficulty progression so that players don't get frustrated while playing challenging parts of the game and decided to not add simpler control schemes as we received some feedback from students asking for more challenging levels.

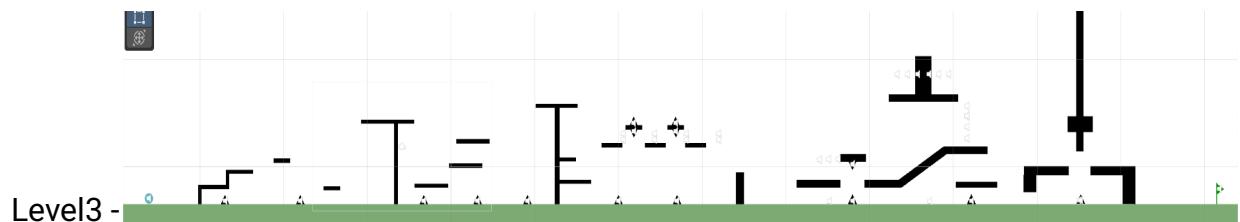
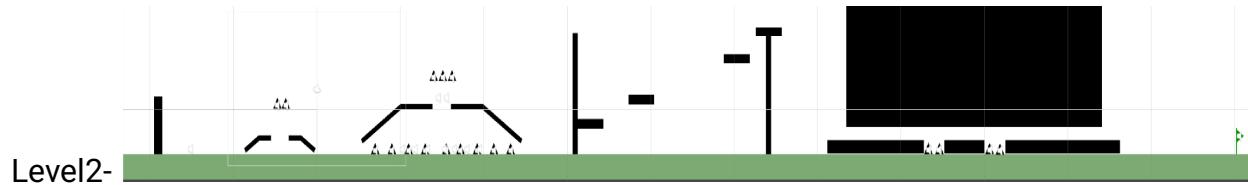
Testing Strategy

- Will measure the reduction in player deaths and restarts in Level 3 after the stated fixes
- Will collect feedback on the updated and additional levels
- Will track player progression to ensure a smoother difficulty progression

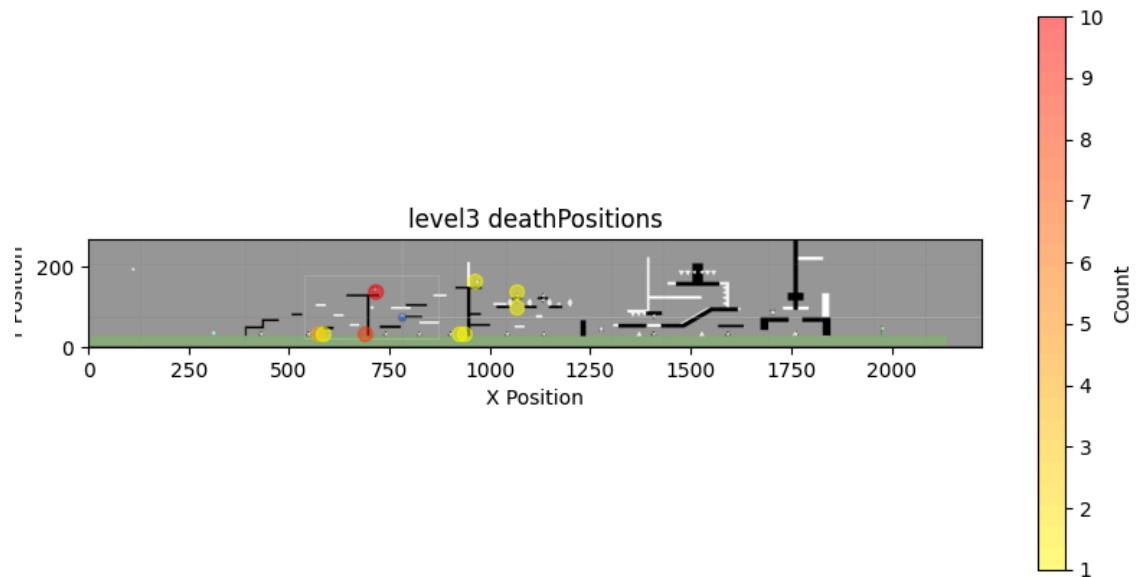
Before: Level 2 and level 3 had significant change in difficulty levels



After: Level 2 and Level 3 were extended and updated to balance the difficulty level such that level 2 is slightly less difficult than level 3.



Now, we can clearly see that players die less time in level 3 after we introduce the new levels.



Hypothesized Issue #4

Platform friction and movement physics

Description

Players encounter unnatural physics when interacting with moving platforms which make certain challenges frustrating.

Significance

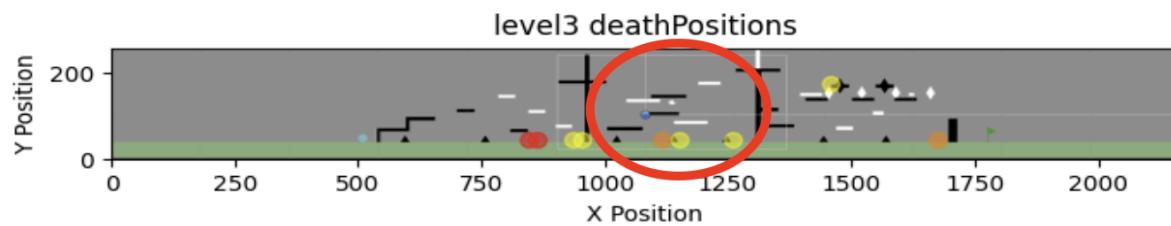
Natural interactions with moving platforms are essential for maintaining immersion and ensuring that challenges are enjoyable rather than frustrating.

Feedback/Data points

- A player noted, "Your moving platforms don't have friction, so the ball doesn't move with the platforms"
- Two players felt that the ball should move along with the moving platform.
- Several players flagged platform interactions as unintuitive, particularly during jumping on moving platforms.

Analytics Support:

In metric #3, we found that several players died in the moving platform area.



Potential Fixes

1. Implement friction so players move naturally with platforms.
2. Remove the moving platform.

Implemented Solution

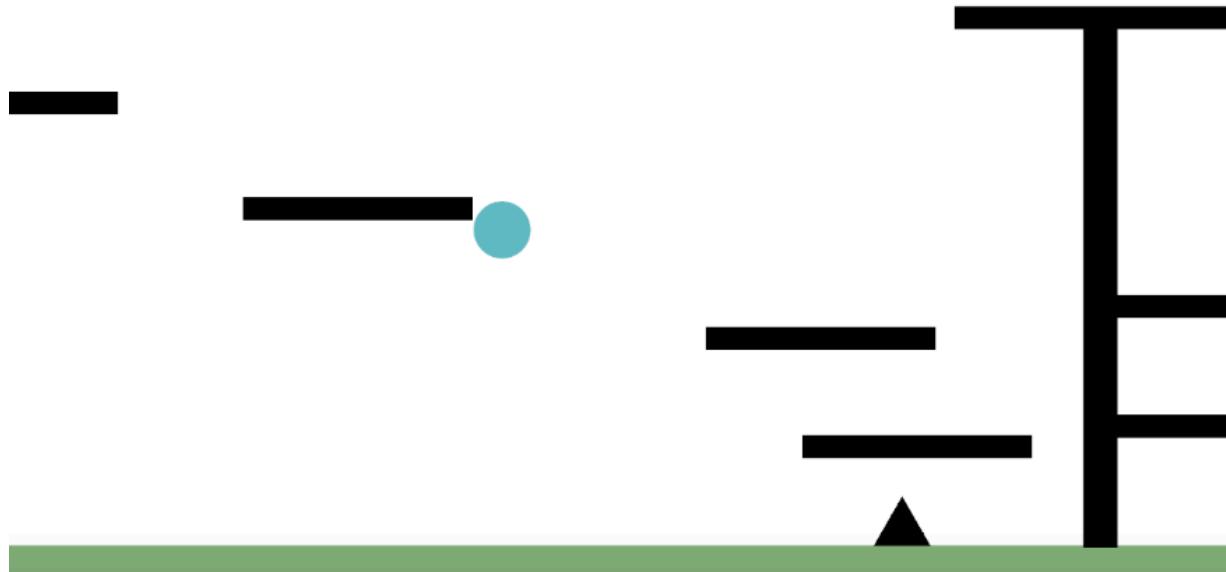
Fiction was added to moving platforms to align player movement naturally along with the moving platform. We decided to add friction to moving platforms to give the players an improved experience while completing interesting challenges.

Testing Strategy

- Measure the rate of deaths caused by platform related physics before and after adjustments.
- Collect player feedback on the new physics system.

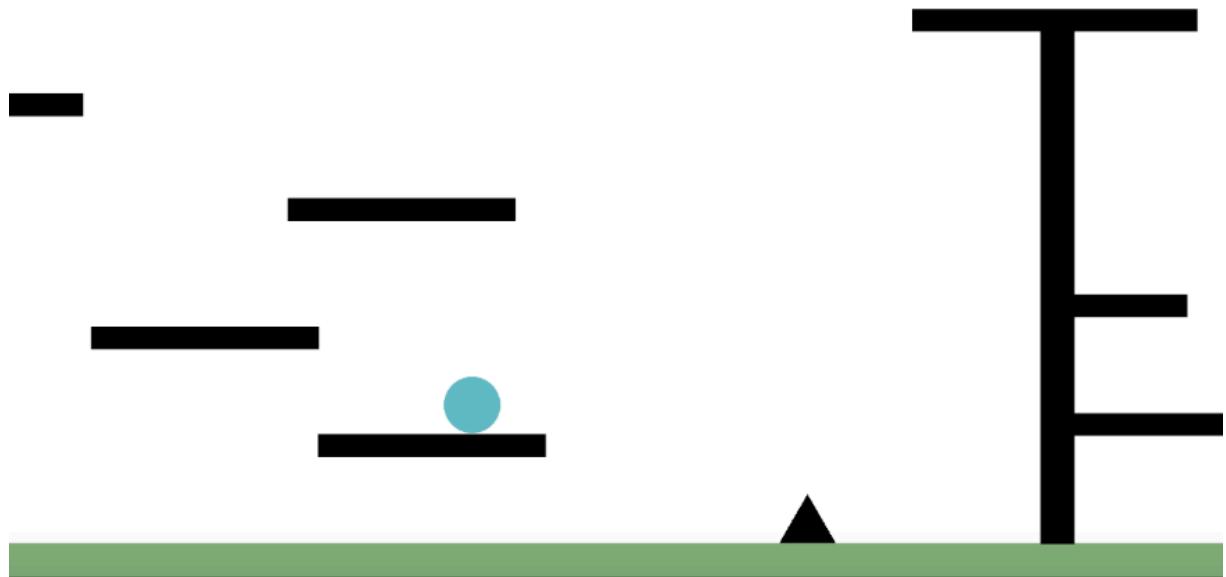
Before: The ball was not moving along the moving platform and it would fall down once the platform moved.

[Menu](#)

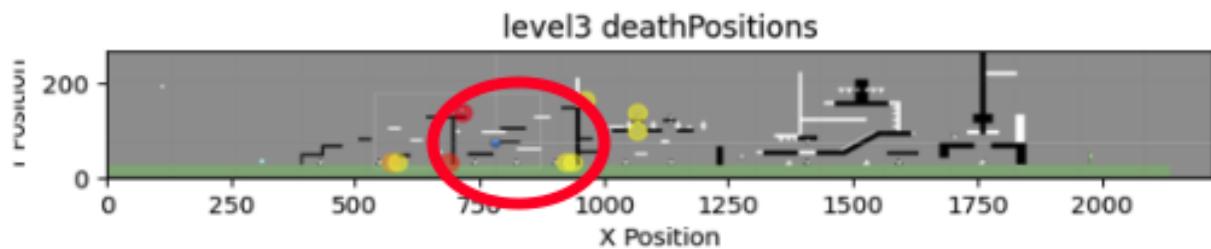


After: Now, the ball is interacting with the moving platform and moves along with it.

[Menu](#)



As you can see in the graph, players died less time in this area.



Hypothesized Issues(Beta)

Hypothesized Issue	Feedback	Potential Fix 1	Potential Fix 2	Fix Timeline (Action Plan)
Players get confused between traps, obstacles and destination	<p>Without the UI text I have no idea the triangle would be a trap I should avoid, since it has the same shape as the finish flag.</p> <p>The destination was in the same shape of obstacle, which is not very clear</p>	Add a help text to differentiate traps, obstacles and destinations from each other.	Add an instruction screen at the beginning of the game to explain the elements ahead of the start of the game.	We have added an instruction screen at the beginning of the game which explains the traps and obstacles. We have also added a green flag to indicate the destination in each level.
Help texts were not clear and were disappearing too fast	Messages disappears too fast when player moving fast	Increasing the wait time of each help text so that it stays longer	Concise and clear help text which stays static on the screen	We have changed the look of help texts and now we have added

				just the help keys to the floor. The texts are now short, clear and are placed at appropriate locations.
Player was getting stuck in the game and had to use restart button. Difficulty of level 3 was very high as compared to level 1 and level 2.	Confused at level 3, player always goes ahead, didn't realize the white platform on top Cannot figure out timing to reach platform white in level 3	Explain the use of restart functionality. Decrease the difficulty for level 3	Remove the restart button altogether. Make Level 3 more efficient and understanding.	We removed the restart button from each level because it was not relevant. We worked on the design of level 3 to improve the flow and make it more understanding to the players.
Players didn't understand the need for flip count limit.	After flips exhausted player doesn't know what to do. Number of flips not enough on level 2 Usage of flips does not feel natural, player is confused	Increase the flip count limit for each level	Remove the limit on number of flips for each level	We removed the limit on the number of flips on each level because it doesn't align well with the objective of our game and didn't seem necessary.

External References

Name	Link	Usage
Color switch gameplay	https://www.youtube.com/shorts/dKfm-gXcRGU	We drew inspiration from this game and came up with the idea of color switching merged with a 2D platformer.
Menu Button	https://www.youtube.com/watch?v=YQaYQrN1oYQ	Took help of this tutorial to build an in-built Menu button for each level.
Audio Asset	https://freesound.org/	All the audio effects were referenced from this platform.

Appendix

Misc

Other miscellaneous information if any.