





Game Design Document

B/W
Team B/W

Team Members

Name	Roles	E-mail & GitHub ID
<p><i>Hao Feng</i></p> 	<p><i>Team Captain, Physics, User Interface</i></p>	<p>hfeng477@usc.edu Matt23-star</p>
<p><i>Xuejin Zheng</i></p> 	<p><i>Product Manager, Physics, User Interface</i></p>	<p>xuejinzh@usc.edu zzxxjj1</p>
<p><i>Qijun He</i></p> 	<p><i>Stenographer, Physics, User Interface</i></p>	<p>qijunhe@usc.edu qijunhe</p>

Important References

Unity Project GitHub Repository	https://github.com/CSCI-526/cs-526-spring-2024-wednesday-project-b-w/tree/main/Alpha
Playable Alpha Progress Check Build	https://matt23-star.github.io/526%20project/Alpha_check/
Playable Alpha Build	https://matt23-star.github.io/526%20project/Alpha/ or https://zzxxjj1.github.io/BW_Alpha/
Alpha Gameplay Video	https://youtu.be/7lrQOAaS6HA
Alpha Survey	https://docs.google.com/spreadsheets/d/1FyraF_Ki7RV5AB65uFCYzPqZa6aofWlr7ccoQIL/Ya0/edit
Playable Beta Progress Check Build	https://matt23-star.github.io/526%20project/Beta_check or https://zzxxjj1.github.io/BW_Beta_Update/
Playable Beta Build	https://zzxxjj1.github.io/BW_Beta_Update/
Beta Gameplay Video	https://youtu.be/Pu9SohwBM_I
Beta Survey	https://docs.google.com/forms/d/e/1FAIpQLSeaiNkX3AG62E5q8vRN3jVBQk6XHmu_pF1FIEQ_Tr-OQj-mpbA/viewform?usp=sf_link
Playable Gold Progress Check Build	https://zzxxjj1.github.io/BW_Gold/
Playable Gold Build	https://zzxxjj1.github.io/BW_Gold_Final/ or https://matt23-star.github.io/526%20project/Gold/
Gold Gameplay Video	 B / W

Game Introduction

Logline

Logline - Our game is a 2D-platformer game where you switch the color of the character or change colors of the blocks to solve puzzles and traverse the level.

Player Goals / Win Conditions

*Complete the levels with limited blood volume
Kill as many enemies as possible
Explore the entire map and solve all the puzzles*

Game Description

Our game is a 2D-platformer game featuring an innovative color-switching mechanic. As the player, we need to solve puzzles and reach the end without being killed by other creatures or falling into the abyss. We keep some traditional mechanics of 2D-platformers, like movement mechanic and jump mechanic, etc.

And for the color switching mechanic, it is not just a visual change but is integral to gameplay, which dictates the player's interaction with the environment. Platforms and barriers will engage with the character only when the interaction conditions of color are satisfied, making the color switch to a pivotal role in the gameplay. Players can change colors to enable themselves to walk on platforms of opposite colors, kill enemies of opposite colors or pass through obstacles with opposite colors. This introduces a new layer of strategy, as players must constantly adapt to the color requirements of the platforms to navigate the levels.

Controls

*Movement: A,D or ←, →
Jump: Space
Gun shoot: J
Color switch: K*

Detailed Design

Game Mechanics (How to Play)

Movement mechanic: Use the keyboard to go through obstacles.

Jump mechanic: Use the keyboard to reach new platforms, kill enemies or avoid obstacles.

Color switching mechanic: Change the visibility of platforms or other environmental elements to characters through color switching.

Game Mechanic Research

<QIJUN HE>

Game Title	<i>The Legend of Zelda: A Link Between Worlds</i>
Mechanic/System	The player can switch between 3D form and 2D form
Interest	<i>This mechanic interests me because it adds a unique twist to the traditional 2D and 3D Zelda gameplay, combining elements of both into a novel experience. It challenges the player to think in multiple dimensions. This ability transforms the way players perceive obstacles and environments, making them think creatively about movement and exploration in a way that's rare in other games.</i>
Supports other mechanics	<i>Many puzzles in the game are designed with this mechanic in mind, requiring the player to merge into walls to bypass obstacles, move between gaps, or activate switches that are otherwise unreachable. It seamlessly integrates with the environment to encourage players to view puzzles from multiple perspectives.</i>
Supported by	<i>The game's environments are thoughtfully designed to support this mechanic. Walls are not just barriers but potential paths, decorated with visual cues and designs that hint at possible interactions. This design philosophy ensures that the mechanic feels integral to the game world, rather than a tacked-on feature.</i>

Utility	<i>In our game, the player has the ability to switch between black form and white form which is similar to the Legend of Zelda's 3D form and 2D form. When we are designing puzzles for our game, we should keep this mechanic in mind, and thoughtfully arrange the black and white obstacles of the puzzle so that the player can think creatively between two forms during gameplay.</i>
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<Hao Feng>

Game Title	<i>Ori and the Will of the Wisps</i>
Mechanic/System	<i>Interaction mechanic system with the platform</i>
Interest	<i>The interaction between the player and the platforming elements is a central aspect of the game's design, making it both challenging and engaging. In classic platformer games, the focus is often more on straightforward jumping and obstacle navigation, with less emphasis on interacting with the environment or integrating the platforming mechanics with the story.</i>
Supports other mechanics	<i>Players interact with the environment in various ways, such as using abilities to manipulate objects or elements within the world to create new pathways or solve puzzles. For instance, players might need to use the "Stomp" ability to break through barriers or the "Charge Flame" to ignite lanterns and open new paths.</i>
Supported by	<i>The interaction mechanic system with the platform is intricately supported by other game mechanics, especially the jump, move and abilities mechanics, creating a rich and dynamic gameplay experience. For example, Bash allows Ori to use enemies or projectiles as launch points to extend jumps. And then, this ability allows Ori to interact with certain elements in the environment (like projectiles or lanterns) to propel himself in different directions. It's a critical mechanic for solving puzzles and navigating the environment, directly affecting how Ori interacts with platforms by creating new pathways or accessing previously unreachable areas.</i>
Utility	<i>Change the visibility of platforms or other environmental elements to characters through color switching.</i>

<Xuejin Zheng>

Game Title	<i>Hollow Knight</i>
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Mechanic/System	<i>Jump Mechanic</i>
Interest	<i>In Hollow Knight, the hollow knight is able to do a bunch of jumping tricks, such as dashing, charge jump, wall jump, double jump. Overall, the jump mechanic in Hollow Knight makes the game control more smooth and allows the player to have more flexible and creative ways to travel on the map.</i>
Supports other mechanics	<i>The jump mechanic supports the combat mechanics. The hollow knight is able to attack the enemy while jumping/dodging the enemies' attacks. The jump mechanic supports the puzzles that are set up by the creators. The hollow knight is able to dash/double jump/wall jump to dodge traps or hidden rooms.</i>
Supported by	<i>The jump mechanic is supported by the charms mechanic. The hollow knight is able to equip different charms which give the player additional jump abilities</i>
Utility	<i>In B/W, the jump mechanic can also be applied. By adopting the jump mechanic of Hollow Knight, we could be more creative in designing the map such as making hidden paths, jumping to avoid obstacles, etc.</i>

Matrices

Twist & Mechanics Matrix

Mechanics	Description	Interaction with Twist	Affected Genre Elements	Type of Genre Innovation	Supports
Color Switching (Core Mechanics)	Player can switch the character's color to black and white and change the solidity or visibility of environmental elements according to player's color	Players can change the solidity or visibility of environmental objects including platforms and obstacles so that they can integrate their bodies into some environmental elements.	Player movement, Strategy, Puzzle, terrain	Addition, Subtraction	Enemy, Color gun
Enemy	A barrier type that can be black, white, or gray.	Players can only kill black and white enemies.	Strategy, Puzzle, Player movement	Subtraction, addition	Color Switching
Color gun	A gun which shoot black or white pigments	Players can change the color of some barriers.	Puzzle, Strategy, terrain	Addition, Subtraction	Color Switching
Block machine	A machine where moving blocks can always be generated.	Players will be pushed back by gray barriers and can go through the block with the same color.	Puzzle, Strategy, terrain	combination	Color switching

Mechanic Interaction Matrix

Subject / Object	Color Switching	Enemy	Color gun	Block machine
Color Switching	-			
Enemy	Players need to change their own color to kill enemies with different colors and also can find a hidden pathway for avoiding enemies.	-		
Color gun	The gun can change the color of some environmental elements. And then, the player can change their own color to go through them.	The gun cannot kill the enemy and the bullet will go through the enemy's body.	-	
Block machine	Players can go through the block with the same color by color switching or find hidden pathways to avoid blocks.	Enemy will be push back	the bullet will go through the gray block and change the colors of black and white blocks.	-

Single Mechanic Challenge Matrix

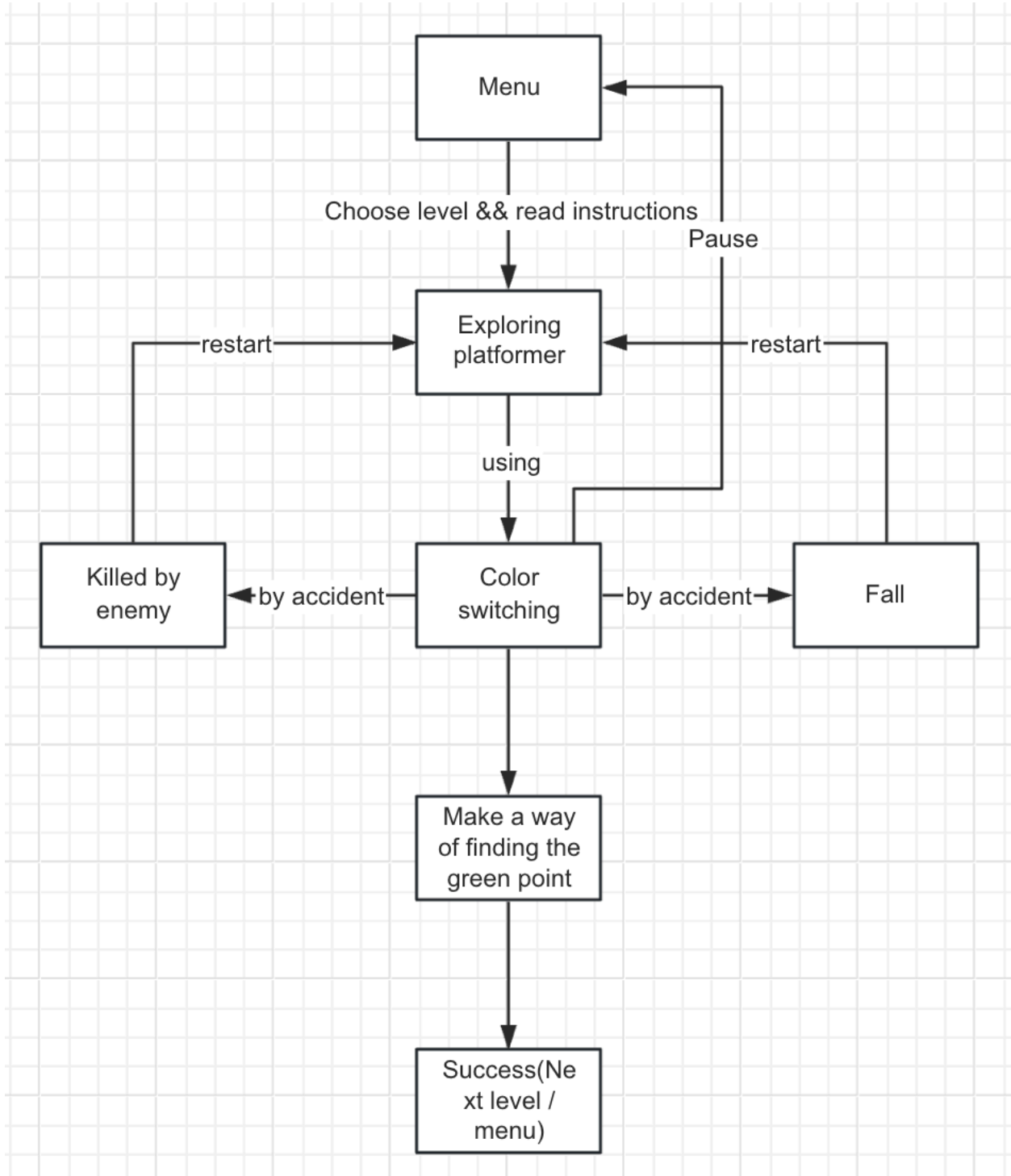
Challenge	Location	Difficulty	Player Must Learn	Instructions	Required Skills
Challenge 1	The beginning of first level	Tutorial	Controls for color switching mechanic	Explicit but concise UI pop-ups	None

Challenge 2	Beginning of second level	Medium	How to use this mechanic with another	None	Basics of this and other mechanic
Challenge 3	Beginning of first level	Easy	Switch color in order to drop down	None	Basic mechanic
Challenge 4	Middle of first level	Medium	How to use this mechanic to get new platform	None	Basic mechanic
Challenge 5	Beginning of second level	Easy	How to use the mechanic to kill enemies overcome small obstacles	The instructions on the menu page	Fundamentals of mechanic
Challenge 6	Middle of second level	Medium	How to use mechanic find a hidden way How to overcome multiple obstacles in a row	None	Basics of mechanic
Challenge 7	Middle of second level	Hard	How to overcome dynamic obstacles	None	proficient
Challenge 8	End of second level	Hard	How to use mechanic for overcoming dynamic obstacles	None	proficient
Challenge 9	Beginning of third level	Medium	Controls for color gun mechanic	Explicit but concise UI pop-ups	Basic mechanic
Challenge 10	Middle of third level	Medium	Controls for color gun mechanic	None	None
Challenge 11	End of third level	Medium	How to use color gun mechanic to solve puzzles	None	Proficient
Challenge 12	Bonus level	Easy	Enjoy a new game mode	None	Basics of mechanic

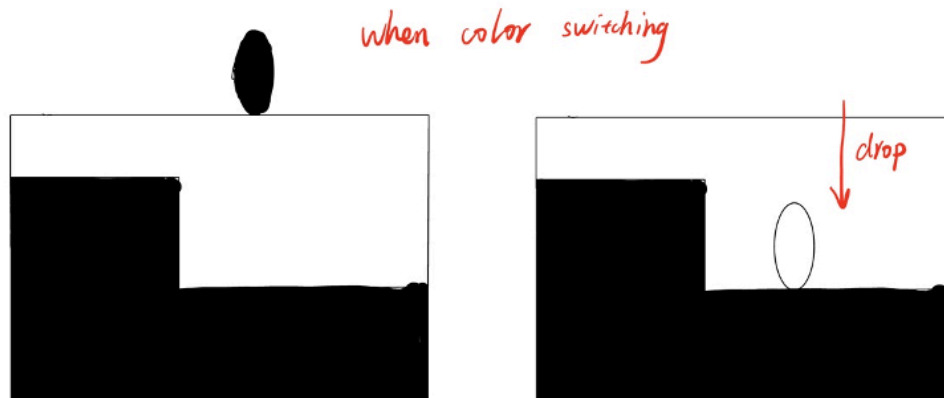
Sketches and Diagrams

Mechanic/Level Sketches

Gameplay loop

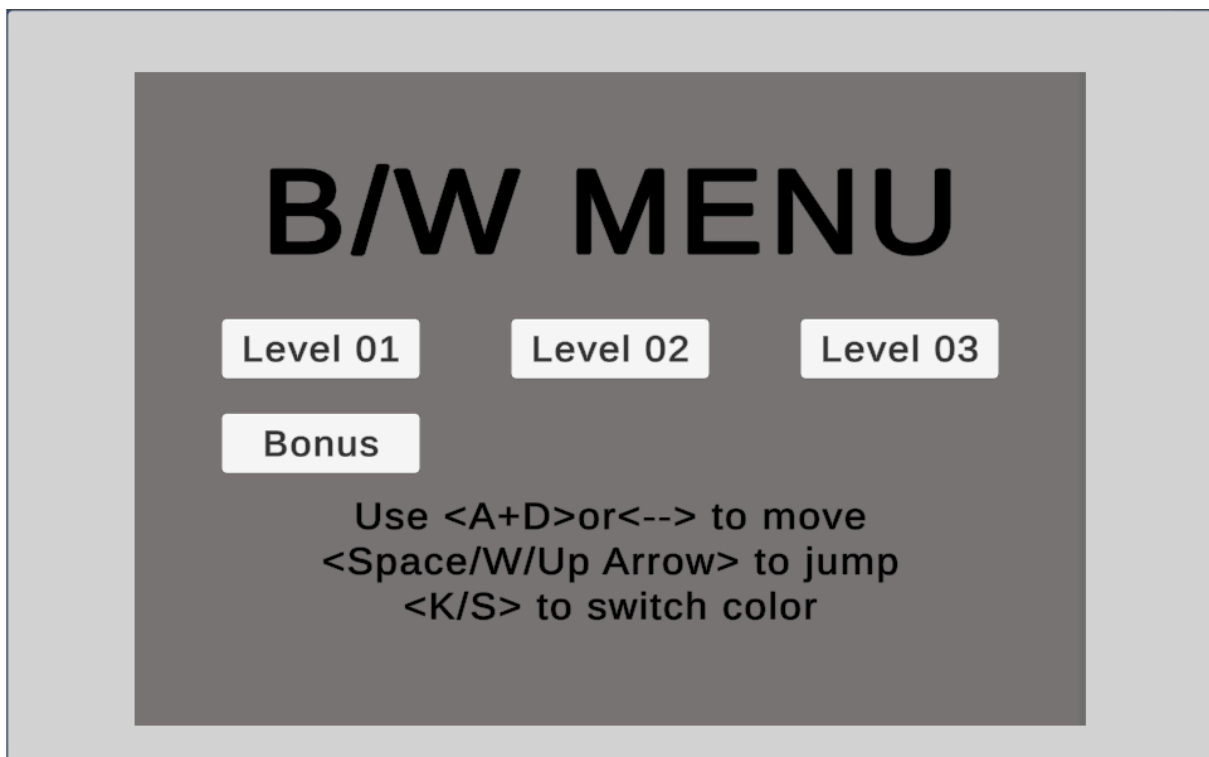


Color Switching mechanic

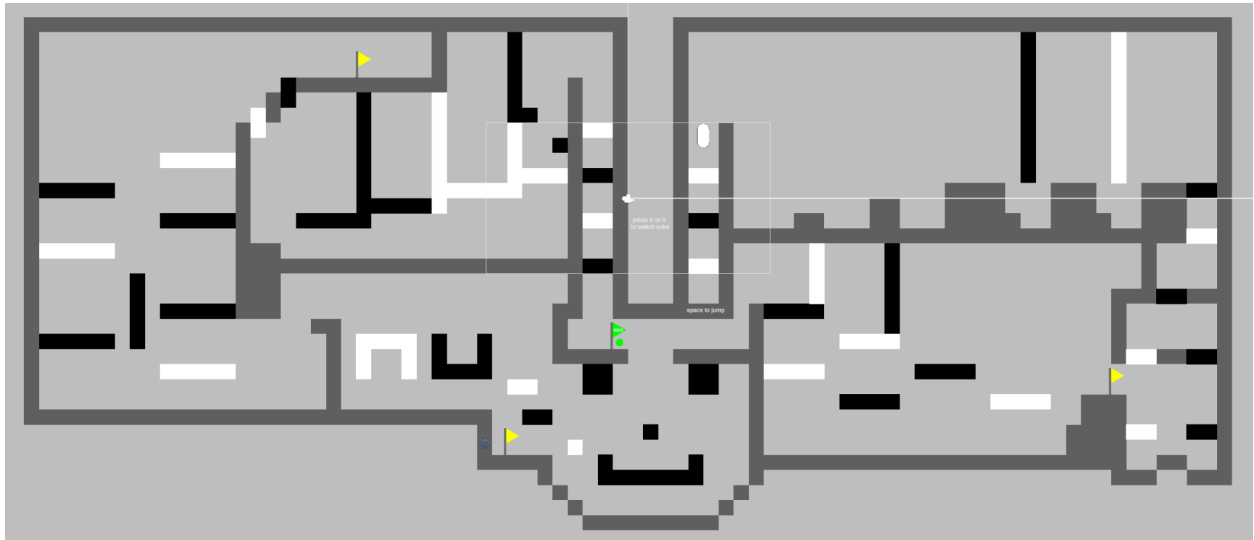


Level Designs

(Homepage & Menu) the player has the option to select any of the presented levels to play. Beneath the choices for levels, the controls for the game are clearly outlined for the player's reference.



(Level 01 tutorial) the player will learn about the basic mechanics of our game in this level

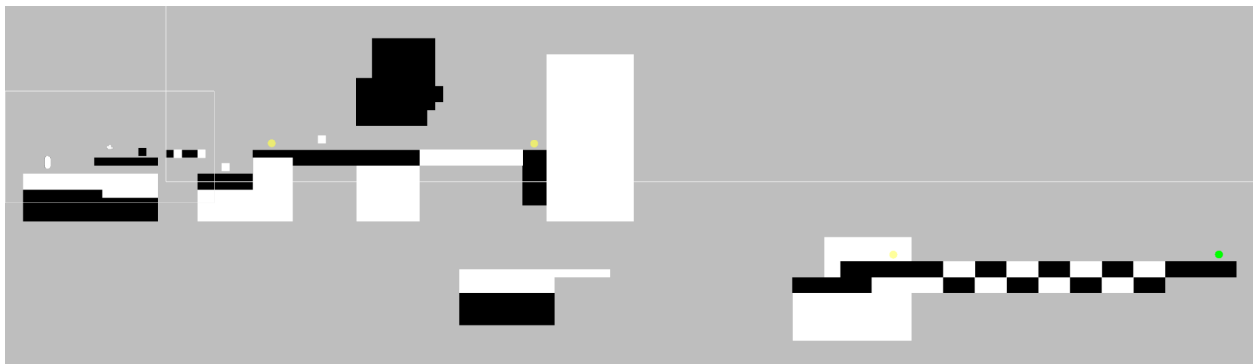


Tutorialization implementation

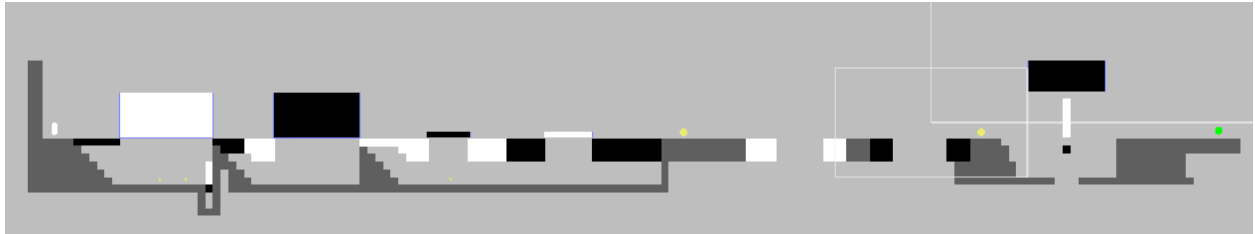
For the tutorial level, I first drop the player (white) on a white block which he will just pass through since they are the same color. This gives the player the first impression that a white object can go through a white object. and then on the left side, there is an instruction to tell the player to switch color, once the player switches the color, it becomes the same color as the block he was standing on, and he will pass through the block again which enhances the impression that I try to make before. and then the player stands on a gray floor which he can not pass through no matter his color, this is when I try to teach the player to jump. but since the player will pass through the block above and can't stand on it, that's when they learn to jump and switch colors at the same time. Once the player completes it, he acquires all the ability to finish our game.

(Level 02)

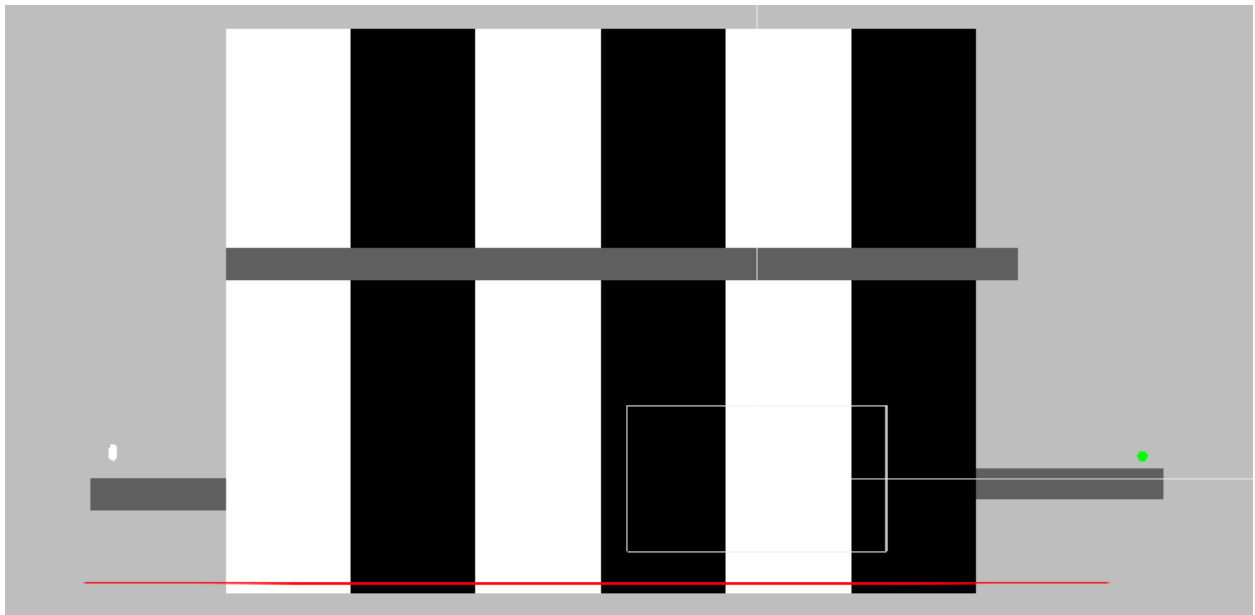
In this level, the player will encounter the enemy obstacle for the first time, as well as the Block Machine. And players need to use color switching ability to hide and kill the enemy, and then try to find a hidden way via changing color.



(Level 03) The player will learn about the Color Gun mechanic of our game in this level, learn basic control and solve a little puzzle in the middle of this level.

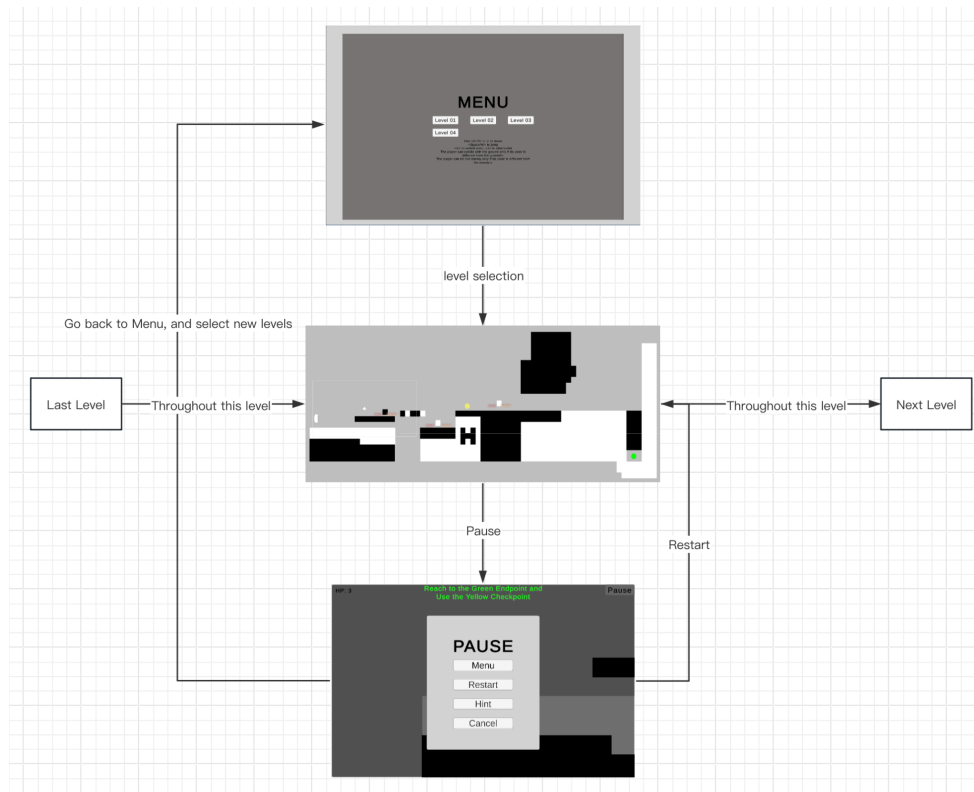


(Bonus level) The player will be able to “fly” inside the color blocks and try to reach the other end by avoiding obstacles on the way.



Game UI

UI Screen Flowchart



Concept Art

Our game only uses 3 colors (black, white and gray). Each color will affect the visibility or solidity to the Character.

Weekly Prototype Descriptions

Describe each of your weekly prototypes here, noting additions, changes, and improvements. It is important to keep this updated every week.

Week-8:

- *Fix jump bug*
- *Design new level sketch*
- *Try to develop the designed mechanics in the game*
- *Discuss future tasks and add new mechanic*

Week-9:

- *Finish level 3 design*
- *Finish instruction level*
- *Finish homepage design*
- *Fix wall stick bug*
- *Change exit point*
- *Improve movement mechanic*

Week-10:

- *Add a shooting tutorial level*
- *Add check-points*
- *Redesign tutorial level*
- *Add color gun mechanic*
- *Solve player is slippery bug*
- *Adjust analytics logistics*

Week-11:

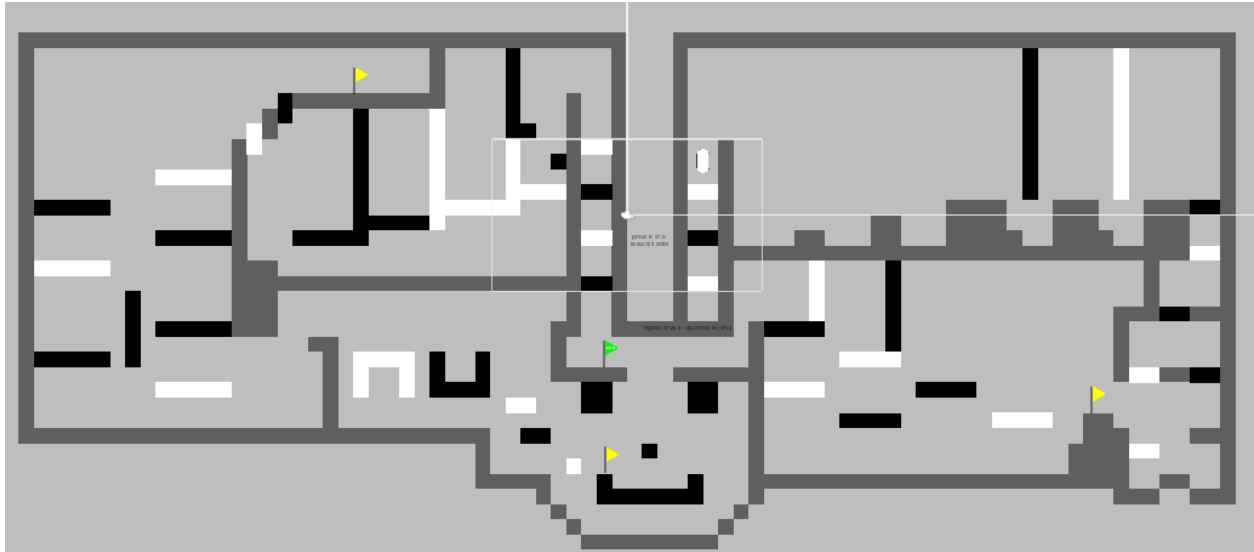
- *Modify Analytics*
- *Fix checkpoint bug*
- *Add bounce-back function of bullet*
- *Design level 05 or Redesign level 04*

Week-12:

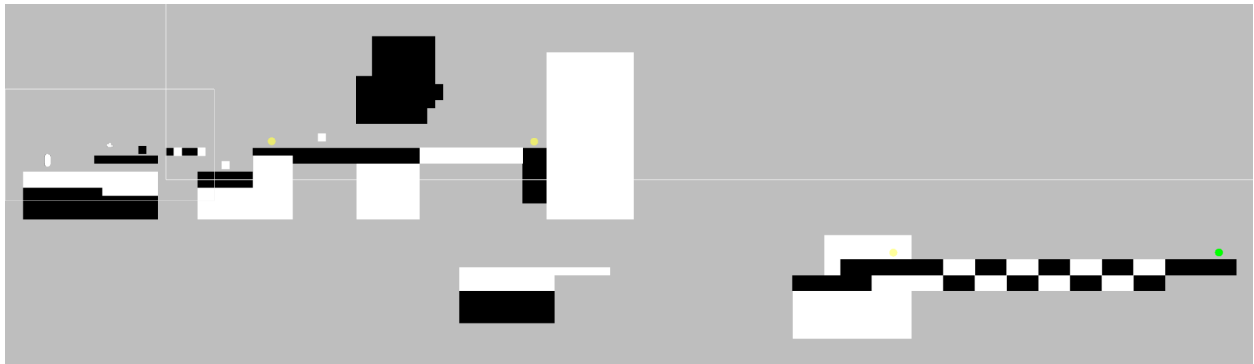
- *Add the Block drop kill enemy function*
- *Design final level*
- *Add UI/UX*

Week-13:

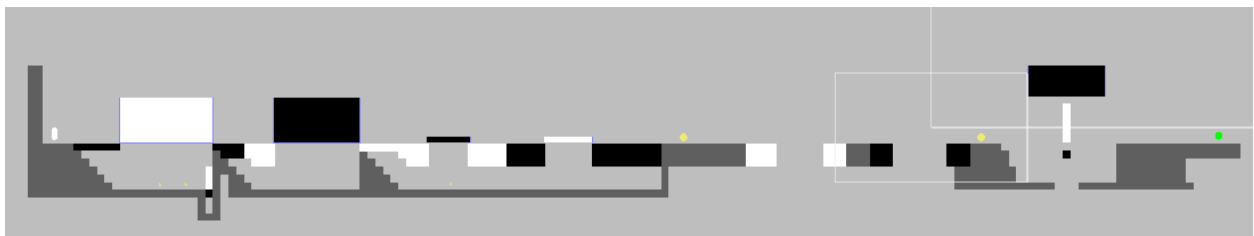
- *Redesign level 01*



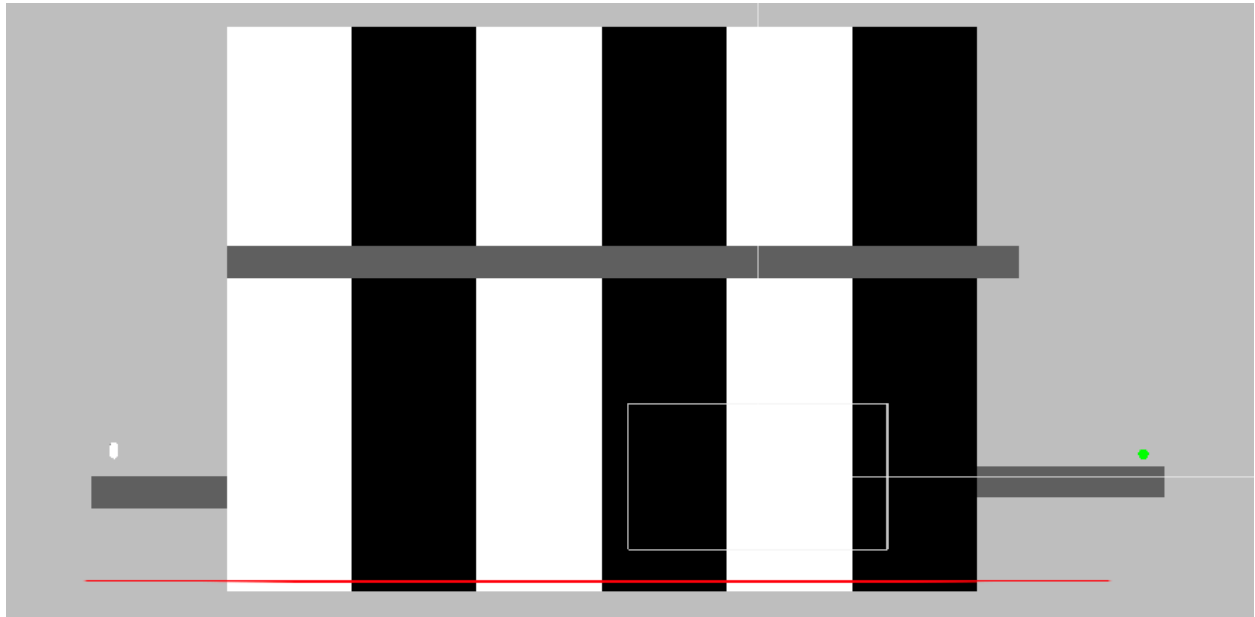
- *Redesign level 02*



- *Redesign level 03*



- *Redesign level 04*



- *Fill up feedback*

Analytics

Feedback and team response from Alpha

Feedback1: Player sliding on surface (fixed in Beta)

Original post: "The player character keeps sliding at some point, making it difficult to control.

Also, I couldn't beat level 2 as I didn't see the correct approach to overcome an obstacle."

Team response: Yes! We noticed this issue because we intentionally changed the player's traction to zero to avoid sticking to wall bugs. Since the player's traction is zero, the player will slide everywhere if there is a momentum applied to the player.

Solution 1: Adding a small box collider at the bottom of the player so that the player will not slide on the ground surface

Solution 2: Delete our player's 0 traction physics2D material from the player's Rigidbody2D and fix the "stick to wall" problem from another angle.

Plan of action: Use two colliders, one collider covers the top, left, right of the player with zero traction to solve the "stick to the wall" problem. And the other one placed at the bottom of the player with traction to avoid sliding bug.

FeedBack2: Level 1 is too hard/no hint (fixed in Beta)

Original post: "Need to add a easy tutorial to tell players how to operate, the level 1 is kind of difficult."

Team response: We apologize for making level 1 "too hard". That is not what our original intentions were. The player thinks level 1 is too difficult because we did not design the teaching level very well to teach them the necessary skills to accomplish the game. Our goal of level 1 was supposed to be easy for the players and learn the core mechanics of switching color, jumping on platforms, and learn what is the end goal of the game.

Solution 1: Re-design of level 1 in order to make it easier and give more hints on the map

Solution 2: Fix upon what we have in level 1 so far by giving more hints

Plan of action: Re-design of level 1 to teach the players the necessary skills to accomplish the game in order to smooth out the difficulty level.

FeedBack3: Have to start over if dead (fixed in Beta)

Original post: "hard, frustrating after trying many times"

Team response: Sorry for the frustrations... The problem is if a player died in the middle of the level. The player will be reset to the original start point at the level which creates a lot of frustration.

Solution : Add checkpoints at the end of each small challenge in the levels.

Plan of action: Implement the functionality of checkpoints and place them at the end of each small challenge in each level.

FeedBack4: Key orientation/Switch color while jumping is hard

Original post: “The color-changing key "k" is kind of difficult for a finger to reach.”

“The most difficult part for me is the movement and color changing control. Sometimes I can not control the movement of the player and change the color at the same time. Also, some terrain in this game it's not easy for me to pass.”

Team response: The player is probably using the arrow keys for moving by their right hand. And press ‘K’ by right hand as well. And this control behavior is happening across the whole game play. That is exactly why we are using “K” for switching colors. We intentionally suggest the players to use both of their hands to play our game. One hand for movement control, and the other hand for switching color. If players only use one hand, the game will be much harder because the players would be confused more easily on when to press jump and when to press switch color.

Solution 1: Disable the arrow keys so that the player won't use them at all.

Solution 2: Give the options to the players by implementing two sets of key controls for them to choose, and disable the other control set.

Plan of action: We will design two sets of key controls. One uses wasd, space, j, and k. The other one uses arrow keys, s, and f. At the beginning of level 1, we will allow the players to choose what they like and disable the other key control set.

FeedBack2: The Length of Level Design

Original post: “I like the idea of lots of shorter levels because it gives you that sense of reward of winning more often.” “I think the level can be shorter, to me, even level 1 is difficult to me, shorter level can help players to have the pleasure of winning.”

Team response: A lot of test players claim that level 1 is a bit too long to finish. After falling from the platform across the end point, they got stuck at the bottom with no direction where to go. This creates a lot of frustrations for the players. The intention of level 1 is to teach the players everything they need to accomplish the whole game. And the level design is well thought out by Qijun. Adding more guidance among the level design is going to be helpful.

Solution 1: Adding checkpoints across level 1 to reward players and better UI with guidance.

Solution 2: Divide the level 1 tutorial level to several shorter levels.

Plan of action:

Methodology Used:

1. Data Collection:

- Used Google Form to track metrics
- Link to data collection
 - i. Checkpoint Pass Rate: [Checkpoint pass rate \(google.com\)](#)
 - ii. Enemy Killing Rate: [Enemy Killing Rate \(google.com\)](#)
 - iii. Location of Death: [Location of death \(google.com\)](#)
 - iv. Checkpoint to Checkpoint Average Time: [Checkpoint-to-Checkpoint Average Time \(google.com\)](#)

2. Data Visualization:

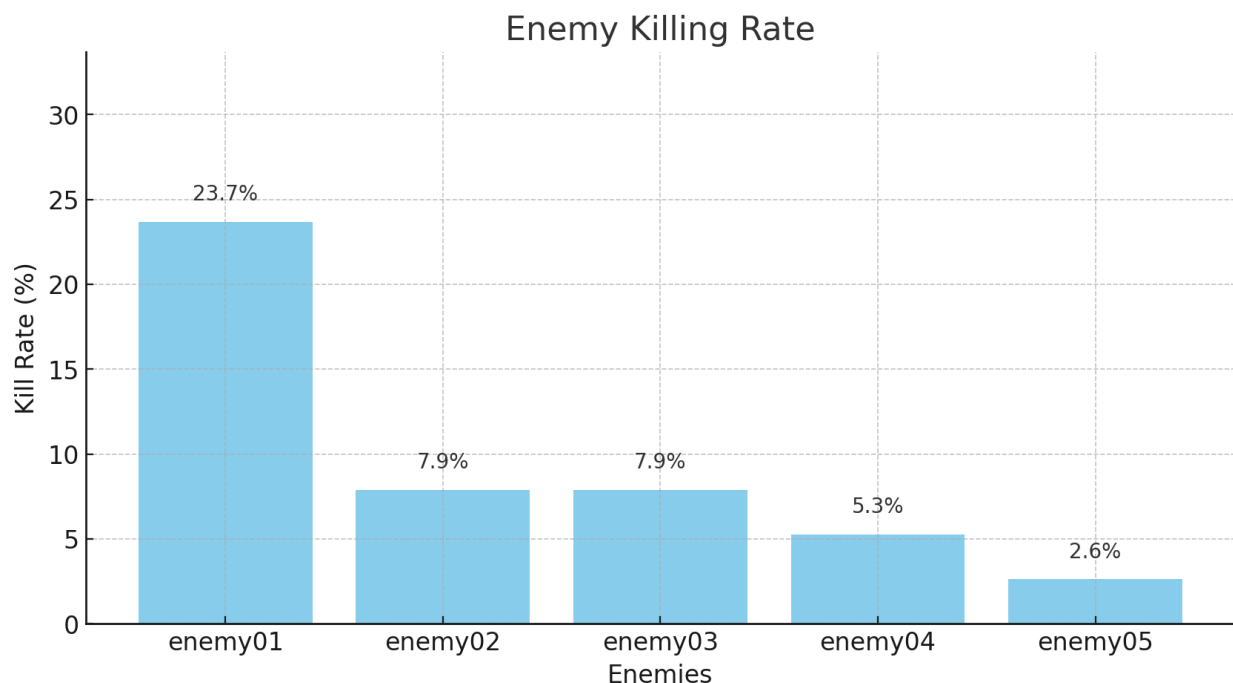
- Used google form built in spreadsheet to visualize data

Analytics - Mockups/Results

Enemy killing rate, checkpoint passing rate, death location, ratio of the use of color switch and color gun

Metric #1: Enemy Killing Rate

Description: This metric, denoted as the enemy killing rate, quantifies the frequency and efficiency with which adversaries are neutralized across various stages of the game. It serves as a pivotal indicator of player engagement strategies and their tactical approaches towards confronting antagonistic entities within the game environment.



Justification:

The systematic monitoring and analysis of the killing rate are paramount for understanding player dynamics and their interaction with hostile elements. This metric not only sheds light on the players' propensity to confront or circumvent adversaries but also facilitates a nuanced understanding of game pacing and difficulty calibration. By meticulously recording these engagements, we gain invaluable insights into whether participants predominantly opt for evasion or confrontation, thereby informing potential adjustments to game design to enhance player experience and engagement.

Hypothesis:

Our underlying assumption posits that a majority of players are inclined towards maximizing enemy neutralization, with an anticipated rate threshold exceeding 66% across all levels.

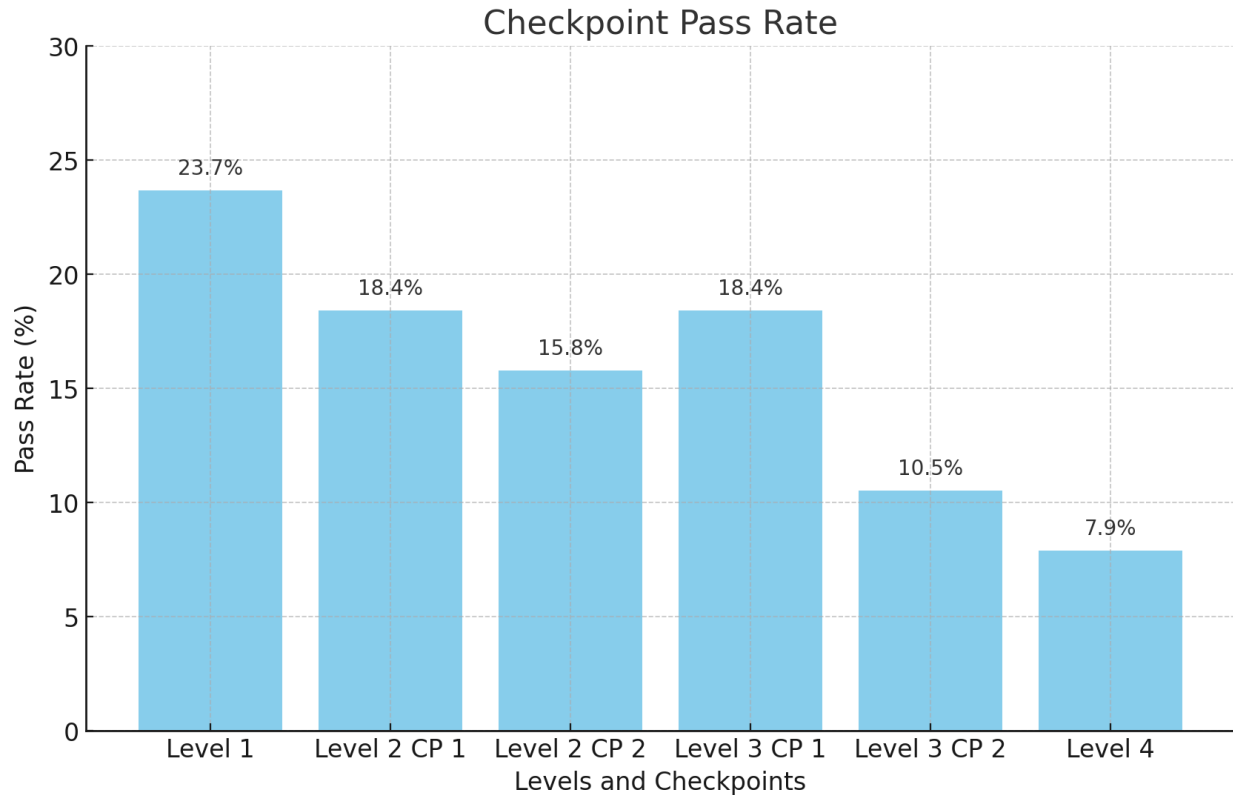
Interpretation:

Should empirical data reveal a significantly lower rate, this discrepancy would necessitate a strategic reassessment of level design, potentially incorporating additional challenges or obstacles to subtly guide player interaction towards a more confrontational engagement with enemies, thereby aligning player behavior with intended game dynamics.

Metric #2: Checkpoint pass rate of each level

Description: This metric meticulously enumerates the occurrences of players successfully reaching and passing checkpoints within each level, thus yielding the Checkpoint Pass Number Count (CPNC). Unlike merely tracking pass rates, this metric aggregates the total instances of successful checkpoint passages, offering a quantitative snapshot of player progression and level engagement.

(Mockup Sketch of hypothesized analytics/ Image of actual results)

**Justification:**

The Checkpoint Pass Number Count serves as a vital indicator of player engagement, level navigability, and the efficacy of level design in guiding player progression. By quantifying the actual counts of checkpoint completions, insights can be gleaned into the overall player throughput and the effectiveness of each level in maintaining player interest and momentum. Anomalies in these counts, such as unexpectedly low numbers, can signal potential bottlenecks or areas of difficulty that may require adjustment to ensure a smooth player experience.

Hypothesis:

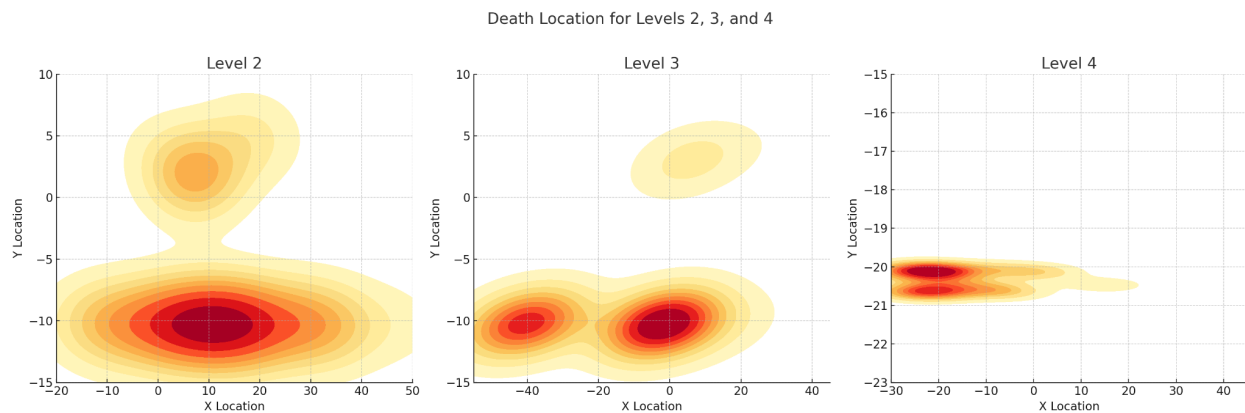
It is hypothesized that initial levels, particularly the first, will exhibit high CPNCs, reflecting their role in orienting players to the game's mechanics and environment.

Interpretation:

This metric is expected to naturally fluctuate in subsequent levels, reflecting the designed escalation in challenge. Should a level display a significant deviation from its anticipated CPNC—especially a marked decrease—this would indicate a potential mismatch between player capability and level difficulty, necessitating a review and possible recalibration of the level's challenges or checkpoint placements to better align with player progression and satisfaction.

Metric #3: Location of death

Description: *This metric involves a detailed tracking of player fatalities at specific coordinates or regions within each level. The primary objective is to map out the 'death zones' where players most frequently succumb to the game's challenges. This analytical approach provides a spatial distribution of player failures, offering a clear visual representation of potentially problematic areas within the game's design.*



Justification:

Understanding the geography of player deaths within the game environment is crucial for diagnosing and rectifying difficulty imbalances. By pinpointing the exact locales where death rates spike, developers can dissect whether these difficulty peaks are by design or indicative of unforeseen bottlenecks that detract from the intended gameplay experience. This metric serves as a diagnostic tool, enabling a focused analysis of level design, challenge placement, and potential navigational ambiguities that could be leading to unintended player frustrations.

Hypothesis:

The working hypothesis suggests that players are likely to encounter significant hurdles at the onset of Level 2, characterized by increased instances of map boundary violations or repeated enemy encounters leading to death. A similar pattern is anticipated for Level 3, reinforcing the need for close scrutiny of these early-stage difficulty spikes.

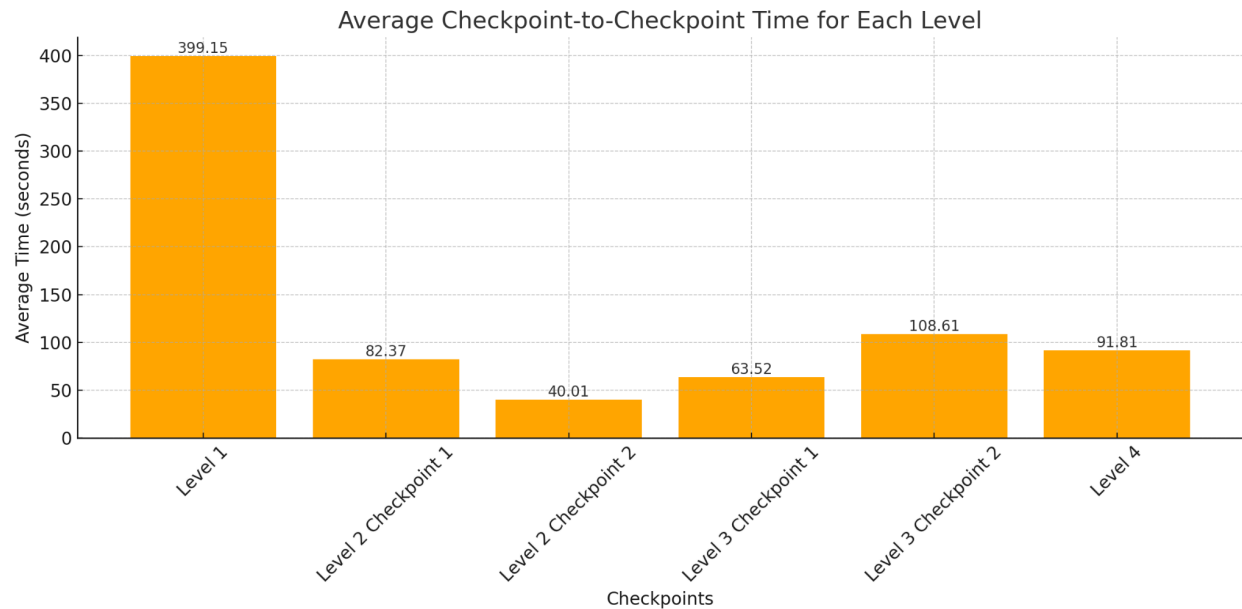
Interpretation:

The mockup visualizations, with dense clusters indicating high-fatality zones and sporadic gray points denoting isolated incidents, are instrumental in highlighting these critical challenge areas. Addressing the causes behind these concentrated death zones is pivotal for ensuring a balanced and enjoyable player journey through the game's successive stages.

Metric #4: Checkpoint-to-Checkpoint Average Time (CCAT)

Description: *The Checkpoint-to-Checkpoint Average Time (CCAT) metric measures the average duration players spend traversing the distance between consecutive checkpoints within a level. This timing begins when a player activates or passes a checkpoint and concludes upon reaching the next. The CCAT provides a granular view*

of player progression through individual segments of a level, highlighting areas that may be particularly challenging or too straightforward.



Justification:

Tracking the average time between checkpoints is instrumental in understanding the pacing and flow of each level. It allows developers to pinpoint specific sections that may not be aligning with the intended difficulty curve or player experience. For instance, longer than average times may indicate a section that players find too difficult or confusing, possibly due to complex puzzles, challenging platform sequences, or unclear objectives. Conversely, shorter times might suggest sections that are too easy or lack engagement, failing to challenge players sufficiently.

Hypothesis:

The ideal CCAT should reflect the intended pacing and difficulty progression of the game. Early levels might have shorter intervals between checkpoints to build player confidence and familiarity with game mechanics. As players progress, these intervals might increase to offer more substantial challenges.

Interpretation:

Significant deviations from the expected CCAT can signal areas requiring adjustment. For example, a section with a notably higher CCAT may benefit from rebalancing to reduce frustration, whereas a section with a particularly low CCAT might be enhanced by adding elements to increase engagement or challenge. Adjustments based on CCAT data can help ensure that each segment of the game contributes effectively to an enjoyable and rewarding player experience.

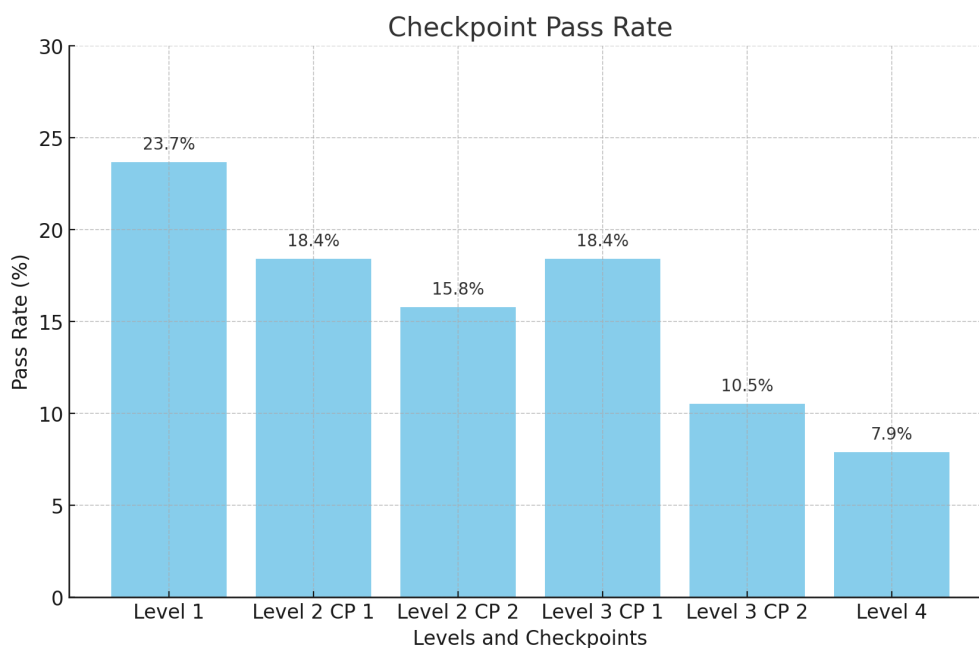
Analytics - Hypothesized Problems & Solutions

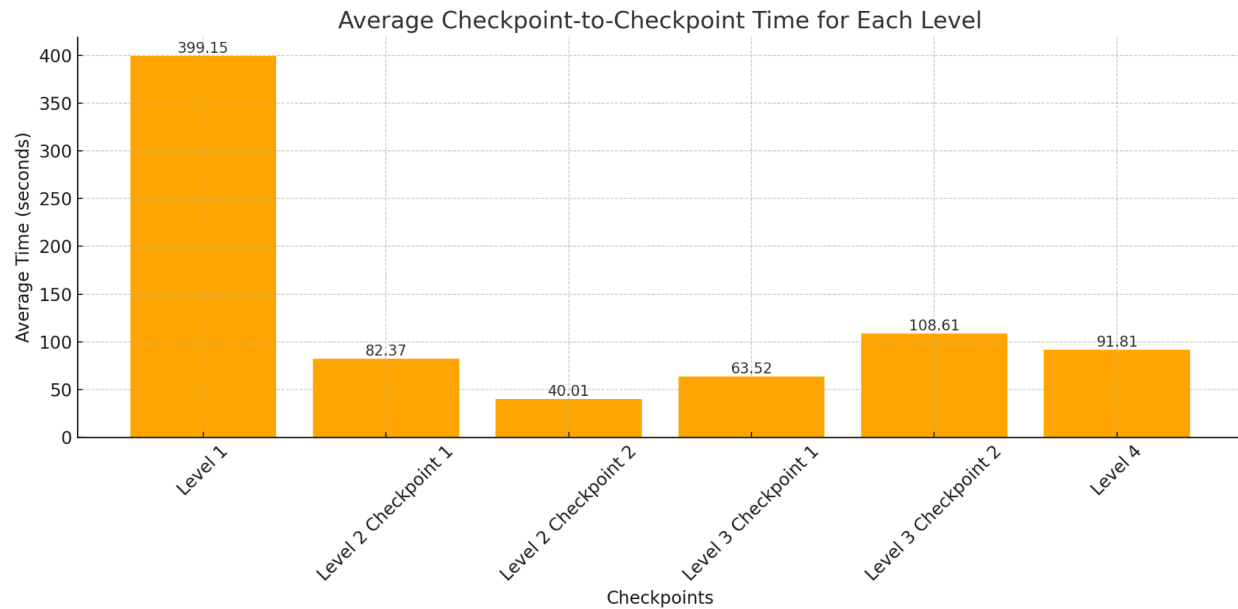
Feedback and team response from Beta

Hypothesized problem #1: Key orientation

Description & Justification: *During the beta test play, we noticed that a lot of our test players use the arrow keys for movement control. The arrow keys control set was not a big issue before beta testing because it's pretty much the industry standard to use "wasd" as movement control nowadays. Since there are a lot of our test players who are not gamers, we are fortunate to find out that some people still prefer to use arrow keys for movement control. This negatively affects the game because players are not able to find a comfortable posture to control the character if they choose to use the arrow keys for movement control. The assumption is made by looking at the feedback of beta testing and watching test players play our beta. A lot of players prefer to use arrow keys.*

Citation: At least one analytic graph, one piece of survey feedback cited
Citation of Graph:





Citation of Survey 1: “Controls are a bit confusing, I want to see the up arrow work as well as space key and W key for jump..”

Citation of Survey 2: “The key binding is also hard to me. I prefer some some bind near spacebar than "k". I don't know the level 1 is hard or the "k" button is hard to press so I can't press double "k" quick enough.”

Explanation of the citations: Based on the above graphs, we can see that the pass rate is quite lower than what we expected. Even for the first level, people are spending the most time getting familiar; a lot of people are giving up because they are not comfortable with the key orientation if they are using the arrow keys for movement controls.

Potential Solution #1: Set up arrow as jump, “s” as switch color, “f” as shooting for those arrow key players.

Potential Solution #2: Implement two sets of controls, one set is “wasd” and the other one is arrow keys. At the beginning of level 1, we will have the players choose which set of control they want to use and disable the other set.

Implemented Solution:

Justification: We choose the first potential solution because it’s not that time consuming. But if we have time, we will try to implement the second potential solution.

Adding the up arrow key as jump alternative key inside our input manager, same goes for “s” for alternative color switch key, and “f” for shooting key. [commit link](#)

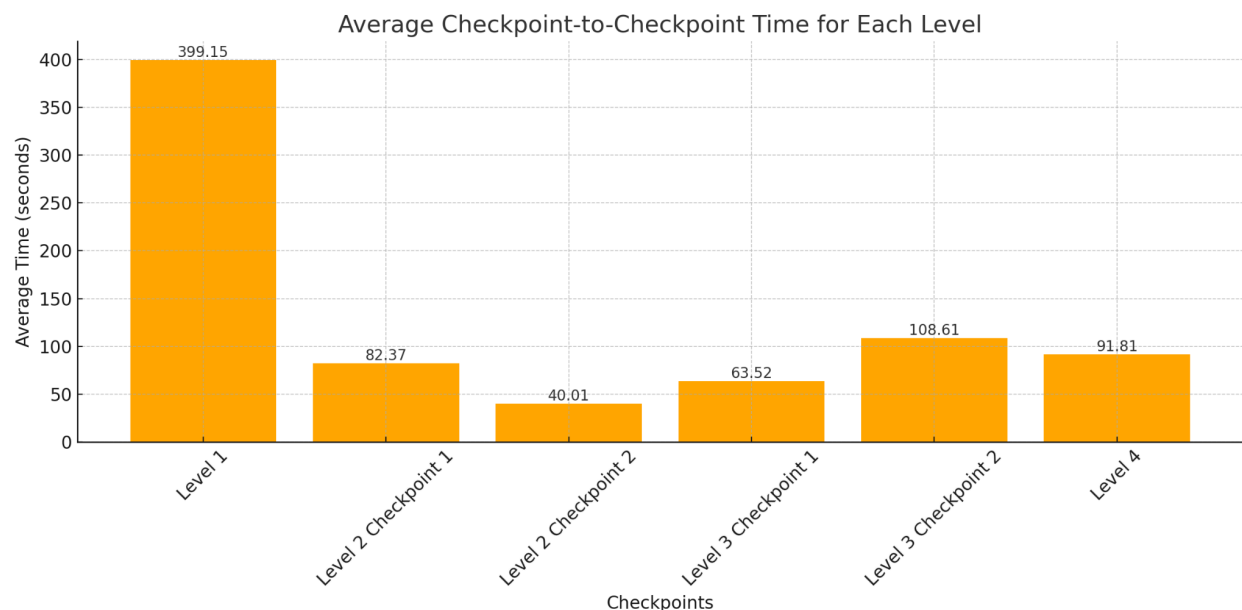
This solution can be future tested by looking at our next test play feedback. And we could also create a new analytics logic to keep track of how many people prefer using the arrow keys and

how many people prefer wasd. And we can also check on the checkpoint pass rate (whether more players are able to accomplish each level).

Hypothesized problem #2: The Length of Level Design

Description & Justification: *A lot of test players claim that level 1 is a bit too long to finish. The assumption is made by looking at the analytics graph of average checkpoint to checkpoint timer. The average time is about 400 seconds. In particular, after falling from the platform across the end point, they got stuck at the bottom with no direction where to go. This creates a lot of frustrations for the players. The intention of level 1 is to teach the players everything they need to accomplish the whole game. And the level design is well thought out by Qijun. Adding more guidance among the level design is going to be helpful.*

Citation: At least one analytic graph, one piece of survey feedback cited
Citation of Graph:



Citation of Survey 1: "I like the idea of lots of shorter levels because it gives you that sense of reward of winning more often."

Citation of Survey 2: "I think the level can be shorter, to me, even level 1 is difficult to me, shorter level can help players to have the pleasure of winning."

Explanation of the citations: Based on the graph of our data, the average time for level 1 is dramatically longer than other levels. That is why people are claiming level 1 is too long for them.

Potential Solution #1: Adding checkpoints across level 1 to reward players and better UI with guidance.

Potential Solution #2: Divide the level 1 tutorial level to several shorter levels.

Implemented Solution:

Justification: We will choose the first potential solution because level 1 design is well thought out. Adding checkpoints among level 1 is probably a work around of the problem.

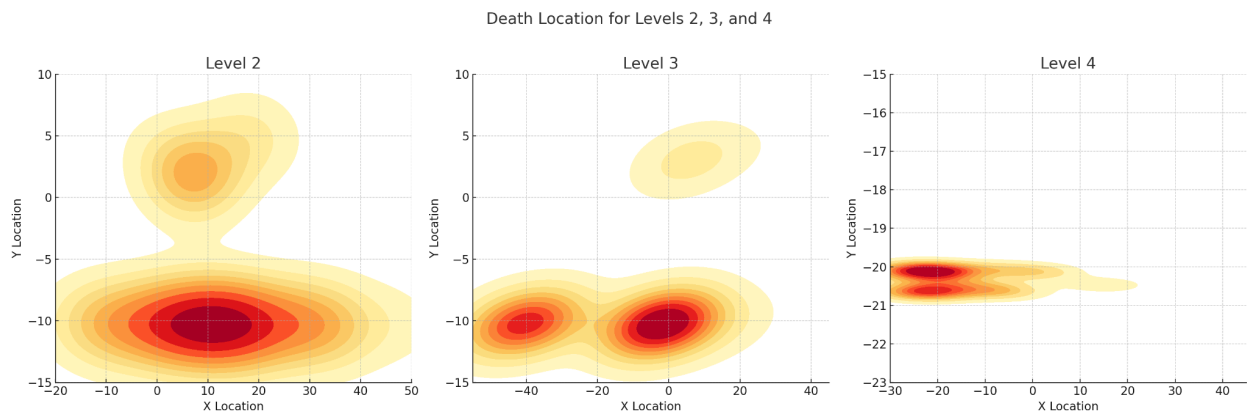
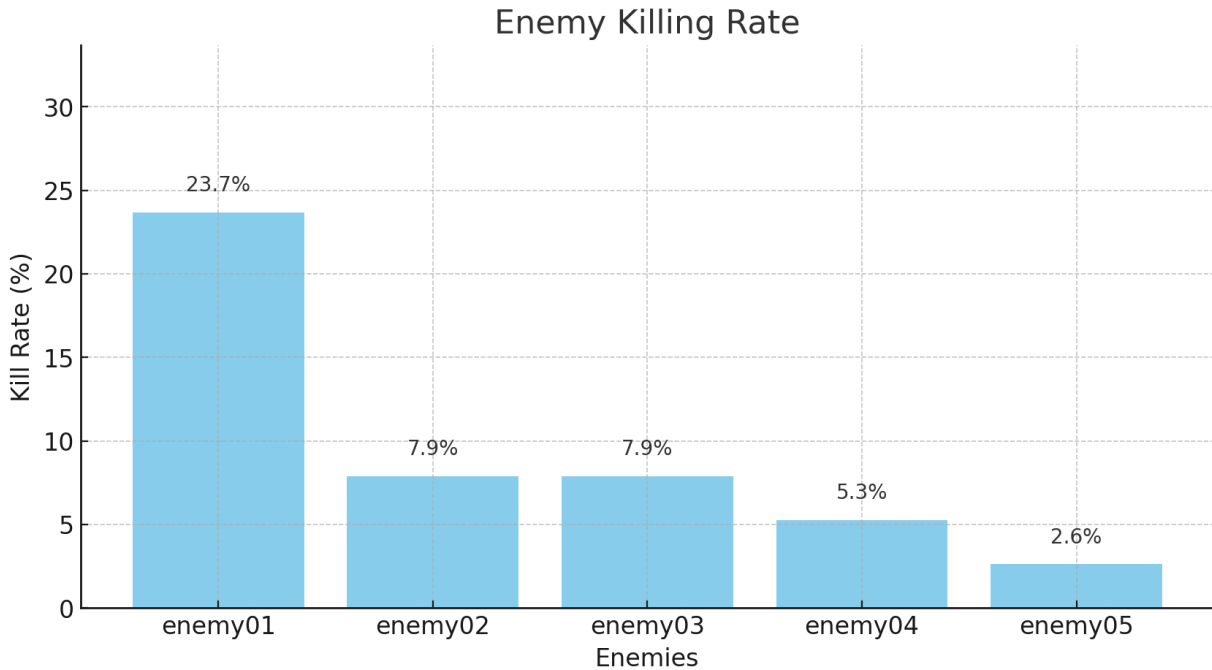
Adding our pre-created checkpoints after each small challenge inside level1 with a congrats message to encourage players. [Commit link](#)

This solution can be future tested by looking at players feedback of next test play and the pass rate graph of level 1.

Hypothesized problem #3: *Confusing on how to deal with the enemies*

Description & Justification: *Players are confused about how to deal with the enemies during beta test play. This is a significant problem because the tutorial level does not teach players how to deal with enemies. The assumption is that when the players reach the beginning of level 2, they do not know what to do when they encounter an enemy. The problem is negatively affecting the game because the enemies are supposed to be moving obstacles on the platform for players to avoid or kill. Enemy features are supposed to make the game more challenging for the players because they have to be careful when to jump on the platform in order to avoid colliding with enemies.*

Citation: At least one analytic graph, one piece of survey feedback cited
Citation of Graph:



Citation of Survey 1: "There is not proper tutorial stating how mechanics are used for eg the enemy, whenever we touch it we just bounce back so there was no proper clarification on it ."

Citation of Survey 2: "The color switching is difficult if you use the arrow keys because you have to use the space bar to jump with your left hand. additionally the enemy behavior is unclear."

Explanation of the citations: Based on the death location of level 2 and 3, there are a couple of people who got killed by the enemies at y coordinate around 5. On the other hand, the enemy killing rate is also quite low which means people are avoiding the enemies instead of trying to kill them.

Potential Solution #1: Place the enemies at the positions where the players can not bypass. Therefore, the players have to kill/jump top of the enemies in order to pass.

Potential Solution #2: Add a tutorial of how to deal with enemies at the beginning of

level 2.

Implemented Solution:

Justification: In our game, we would like to introduce some new features in each level. For level 2, the new feature is enemy. So, potential solution #2 makes more sense in this case.

Adding a tutorial at the beginning of level 2, with just one enemy and some UI instruction on how to kill the enemy. [Commit link](#)

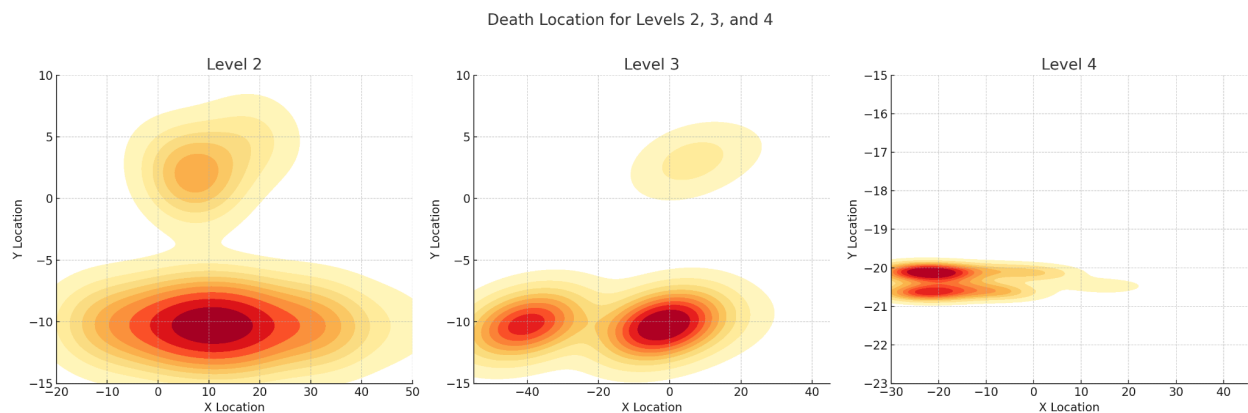
This solution can be future tested by looking at the enemy killing rate of gold test play.

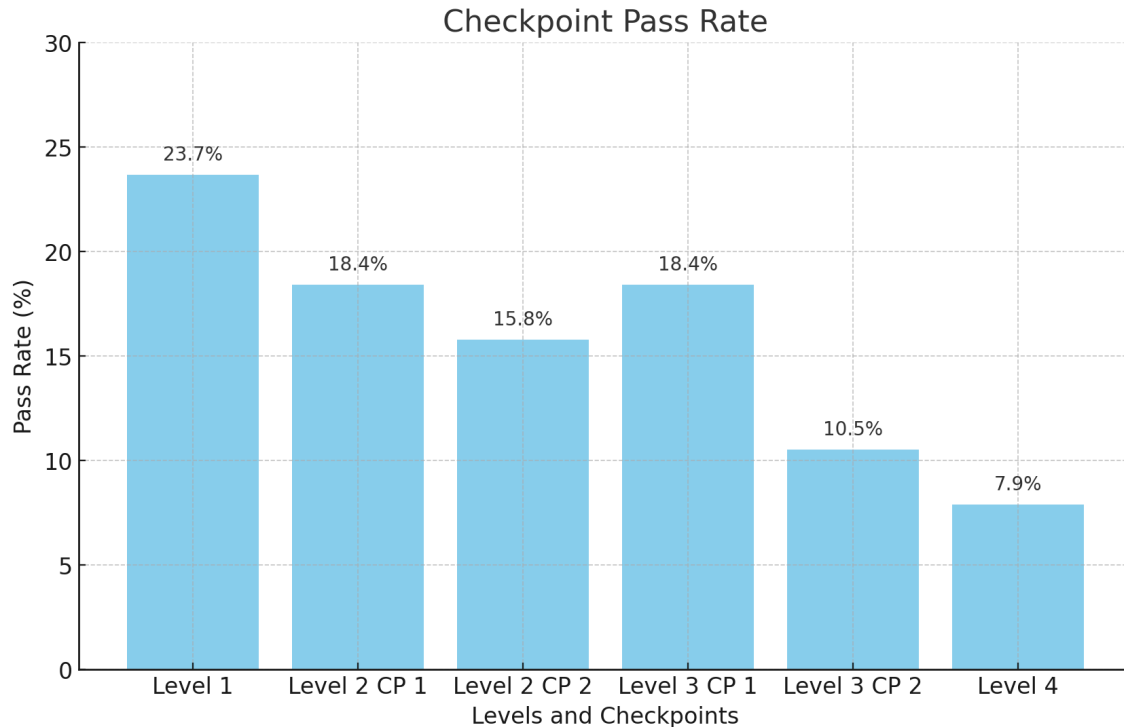
Hypothesized problem #4: Level 4 map design confusion

Description & Justification: *The map design of level 4 is not optimal. Although not a lot of test players have the patience to reach level 4, I can see that almost all of them died from falling out of the map at the beginning of level 4. It's negatively affected by this problem because players are confused about how to use this color gun feature. They will almost likely be stuck on the puzzles that we set for level 4.*

Citation: At least one analytic graph, one piece of survey feedback cited

Citation of Graph:





Citation of Survey 1: "On level 2 or 3 there was a part where we had to shoot the tower which would then eventually fell down and we have to go from that part. That part was unclear since I didn't had any idea that shooting would also break down the wall. Maybe a small instruction could be helpful there"

Explanation of the citations: Based on the graph above, players died from falling out of the map at the beginning which could create a lot of frustrations for them when we are trying to introduce a new feature to the players. Also, from the checkpoint pass rate graph, the pass rate is lower than 10%.

Potential Solution #1: A better color gun feature tutorial at the beginning of level 4.

Potential Solution #2: Teach the player the physics of color blocks so that they will not be confused.

Implemented Solution:

Justification: We need to set a better tutorial for the players to first learn the mechanics of color gun. Then, teach the players the physics of color blocks. So that they are not confused about the upcoming puzzles in level 4.

We need to disable the color switch ability or jump ability temporarily so that they are forced to use the color gun feature to bypass the color block in their way. We also need to teach the physics of color blocks to the players after that. [Commit link](#)

This solution can be future tested by the feedback and the checkpoint pass rate of level 4 from our gold play test.

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	Hao Feng	Qijun He
	Color Switching implemented, GDD Document (check point)	movable barrier implemented
	Xuejin Zheng	Team work(we use unity version control)
	GDD Document Data Analytics	https://github.com/CSCI-526/cs-526-spring-2024-wednesday-project-b-w/commit/df2eb7f171b2b9bc0d83ba60c464662aa1f2f35d
Week 9	Hao Feng	Qijun He
	Add new level 01, modify shooting Script, Add new prefabs, Modify level 2 map design, Change jump mechanic, Add menu page, Add pause page, Add and change all level pages layout, Change player prefab, Build github playable (Hao Feng contribution)	level 3 implemented contribution
	Xuejin Zheng	-
	Modify level 3 map design, implemented analytics mechanics, fixed stick to wall	

	<i>bug, implement bullet push back and push through feature</i> <i>(Xuejin contribution)</i>	
Week 10	Hao Feng	Qijun He
	<i>Add Checkpoint function, Adjust menu, level 02 and 03, Fix slip bug, Realize Color gun mechanic, Design level 04 (tutorial for color gun), Build github playable</i> <i>Contributions</i>	<i>Level 1 implemented</i> <i>Contributions</i>
	Xuejin Zheng	-
	<i>Fixed analytics such that the data is able to be uploaded even though the player isn't able to finish the game</i>	
Week 11	Hao Feng	Qijun He
	<i>Fix Checkpoint bug, Fix analytics data upload bug, Add block dropping mechanic and redesign level 04, Fix endpoint bug, Fix readedText function</i> <i>Contributions</i>	<i>Continue work on Level 1, redesign some of the section</i>
	Xuejin Zheng	-
	<i>Update analytics section of the GDD, Also re-implement the analytics logic of the game, Added a text message when the player reaches checkpoints</i> <i>Contributions(Anonymous bathfire is me...)</i>	
Week 12	Hao Feng	Qijun He

	<i>Collect feedback and think bug solutions</i>	<i>New check point and endpoint setup</i>
	Xuejin Zheng	-
	<i>Collect, filter, and plot beta test play data for further inspection</i>	
Week 13	Hao Feng	Qijun He
	<i>Redesign level 2, adjust levels order, add bonus level, add hint point, add finish page</i> Contributions	<i>Double jump bug fix</i>
	Xuejin Zheng	-
	<i>Edit Analytics - Hypothesized Problems, Modify level 3 map design, Fixed endpoints bug, Modified input system, Fixed some minor bugs</i> Contributions	
Week 14	Hao Feng	Qijun He
	<i>Fixed pause bug, Fixed bug in level 02, Fixed instruction bug, update level 2 design</i> contribution	<i>Video recording</i>
	Xuejin Zheng	-
	<i>Focused on fixing hypothesized issues, Optimized enemy killing logic, Updated checkpoints and endpoints with actual flags</i> Contributions	

Review Notes

Notes/feedback that you receive from staff and playtesters, as well as possible improvements you could make based on it. It is important that the stenographer makes note of these each week, but other team members should also keep track of incoming feedback.

[Feb. 28]

Issue/ Feedback	Potential Fix 1	Potential Fix 2
<i>Player stick to the wall</i>	Add physics2D material to player's rigidbody2D	-
<i>Better jumping system</i>	Using Unity's newer input system	Custom make the player's physics
<i>People get send back to the beginning too many times</i>	Add checkpoints of each level	Lower the difficulty of the levels
<i>End point confuses people</i>	Use a different sprite for end point	-

Some quick notes during test play:

Not enough instruction, J key is not ideal for jump button, icy movement, more puzzles, players kind of hard to reach the end point, implement a wall jump, add more instructions or hints at the beginner levels, flag checkpoints

[Mar. 20]

Issue/ Feedback	Potential Fix 1	Potential Fix 2
<i>Slippery player movement</i>	Change the rigidbody2D to a box	Some better way to solve player "stick to the wall" bug
<i>Level 1 is too hard</i>	Re-design level 1	-

<i>Player get confused when to switch color and when to jump</i>	Have a better tutorial level design to teach the player	Give the players more time to think what they should do in their next move
<i>Check point is missing</i>	Add checkpoints between each puzzles in the levels	-

Quick notes:

Player is too slippery, better navi, jump and switch is too difficult and too hard for players, level 1 need a re-design, timer maybe,

[Mar. 27]

Issue/ Feedback	Potential Fix 1	Potential Fix 2
<i>Too much text tutorial</i>	Need better tutorial	-
<i>Hp does not reset</i>	Fix the logic of HP	-
<i>Player reset has bug</i>	Fix the logic of check point	-

Quick Notes: player is confusing when to jump and when to switch, Hp does not get reset after death, color switch is broken, level 4 tutorial does not work as intended need a better tutorial

[Apr. 10]

Issue/ Feedback	Potential Fix 1	Potential Fix 2
<i>More guide on level 1</i>	Add more UI on where to go for the players	-
<i>Arrow keys controls are not optimal</i>	Add alternative controls for arrow key players	-

Quick Notes: More guide on first level going left, disable arrow keys,

External References

Link to any references (tutorials, assets, etc) from other sources used in your game here.

Explicitly state how they are used.

*Note: You get credit solely for what you have developed yourselves. Assets will not count towards the grade and **must** be mentioned below.*

If external assets / code / tutorials are used without reference, you will incur negative consequences.

Name	Link	Usage
-Unity Ignore Collision	Unity-Scripting API: Physics2D.IgnoreCollision	Ignore collision of between 2D object and tilemap
-Google form analytics tutorial	-User Feedback Survey (updated) - How to Send Unity Data to Google Forms using UnityWebRequest - YouTube	Have a more detailed walk-through of how to use google form to collect data
-Unity Scene Manager API	Unity - Scripting API: SceneManager (unity3d.com)	Learnt from this manual page to manage our different levels