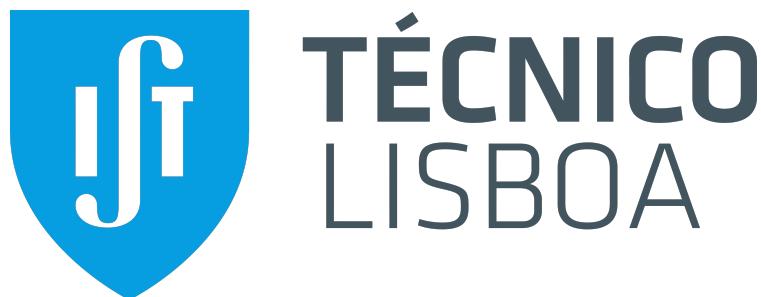


Master in Computer Science and Engineering

1<sup>st</sup> Semester - 1<sup>st</sup> Period - 2023/2024

# Game Design

## Report 2



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# 1 Research and list favorite solutions

## 1.1 Lightning Demos and Sketch big ideas

### 1.1.1 Tomás's idea

To guide my research, I started by highlighting each of the three HMW questions that we picked on the first day of the sprint, and also highlighting our sprint goal.

Our sprint goal is to focus on the transition between the different environments, our HMW questions were:

- HMW increase the difficulty of the game
- HMW change the space and match the mechanics
- HMW maintain the distance between the player and the enemy while changing maps

I first focused on how to increase difficulty. Two games immediately came to mind, the first one was *Subway Surfers* and the other one was *Piano Tiles*, both of these games scale the difficulty by speeding the game up over time, which would translate really well into our game, given that it will be a sort of endless runner. *Subway Surfers* also increases the complexity and the number of obstacles over time, which would also be a viable way of increasing the difficulty in our game.

Then, when focusing on how we could make the transition between the different environments, a game that came to mind was *Geometry Dash* and its use of portals that pull the player in, when they reach a certain distance from it.

I then went to Steam with the intent of browsing the endless amount of games there, looking for any sort of inspiration, in this search, I came across *Runner 3*. *Runner 3* is a platformer whose trailer gave me a couple of ideas, one has to do with raising the difficulty, and the other with the transition between levels. The trailer of this game shows many different level designs, with complex and exciting obstacles, such as the whole floor moving underneath the player, changing what's in front, or a wrecking ball that destroys the floor in front of the player, making them react, or else they lose. This level of complexity really helps keep the game fresh and exciting and we could use some of these concepts to challenge the players in our game.

The other idea I got from *Runner 3* has to do with the transition between environments, in this game the player is sometimes faced with a fork on the road which takes them to different sections of the level. Taking this concept to our game, my idea was to have the level fork every 10 seconds, allowing the player to stay in the same level if they're not ready to continue or move to the next level where they would be rewarded with a larger point modifier.

The next (and final) idea, didn't come from any game or piece of media, but from thinking about the theme of our project. As a solution to how to implement the distance mechanic between the player and the enemy and to tie it back to the main theme, I thought about the enemy being "10 seconds behind" the player, and every time they hit an object, the enemy gets closer and closer until it catches up with the player and the game is over.

### 1.1.2 Jiqi's idea

Based on our "How Might We" (HMW) questions, I began by examining the HMW question related to increasing the difficulty of the game. Specifically, I explored ways to enhance the challenge within our Endless Runner game, drawing inspiration from the game *Subway Surfers*. Their methods of increasing difficulty, such as accelerating the speed or revealing upcoming obstacles only when they are in close proximity (evaluating the player's reaction time), aligned well with our goals and I really liked it.

Moving on to the next HMW question, "How Might We change the space and match the mechanics," I decided to delve deeper into this question because it initially seemed a bit unclear. To address it, I proposed potential solutions for how transitions between game spaces could be accomplished and why such transitions should occur.

Regarding the first aspect—how transitions are executed—I considered games like *Minion Rush*, where changing the map or space occurs when the player collects specific in-game items, such as a snorkeling mask leading to an underwater map. Additionally, I examined the game *Race the Sun*, which uses portals as a means of transitioning between maps. Both of these examples appeared to be effective choices. Continuing with the first aspect, I also analyzed *Talking Tom Gold Run*, where map changes happen as the player enters a dark tunnel with no obstacles, ensuring a seamless transition that doesn't disrupt the game's flow. This approach seemed valuable in maintaining the player's engagement.

As for the second part—why changing the map—I didn't have ample time to fully explore this, but one idea that crossed my mind was that if a player fails to accumulate a sufficient amount of in-game currency (e.g., gold) within a specified time frame (10 seconds), the game could automatically transition to a next map which is more challenging (e.g., more obstacles or more speed).

Turning to the final HMW question, "How Might We maintain the distance between the player and the enemy while changing maps," I came across a solution through coding adjustments. By studying games like *Subway Surfers*, we could indeed be able to implement code to ensure that the player maintains the right distance from pursuing enemies during map transitions. Thankfully, this task proved to be relatively straightforward for us.

### 1.1.3 João's idea

My research was mainly focused on our sprint goal, "the transition between the different environments", and therefore the HMW question "HMW maintain the distance between the player and the enemy while changing maps".

First I focused on the topic of making the environments different. My approach was not so much about the visual design of the environment, but about its mechanics, mostly the movement mechanics. In an endless runner like ours, the player is always moving, we can try and change some aspects of it to match the new environment, such as adding or removing restrictions, for example.

Underwater levels are very versatile in this area. You can make it more restrictive by adding something like an oxygen supply, like *Subnautica*, or decide on a more relaxed approach where you can dive indefinitely, like *Genshin Impact*'s new region. The most important characteristic of this environment for me, which is present in both games, is the possibility of moving anywhere. Despite

the style of Endless Runner not being able to be so "free" in terms of movement, there are some aspects we could try to integrate.

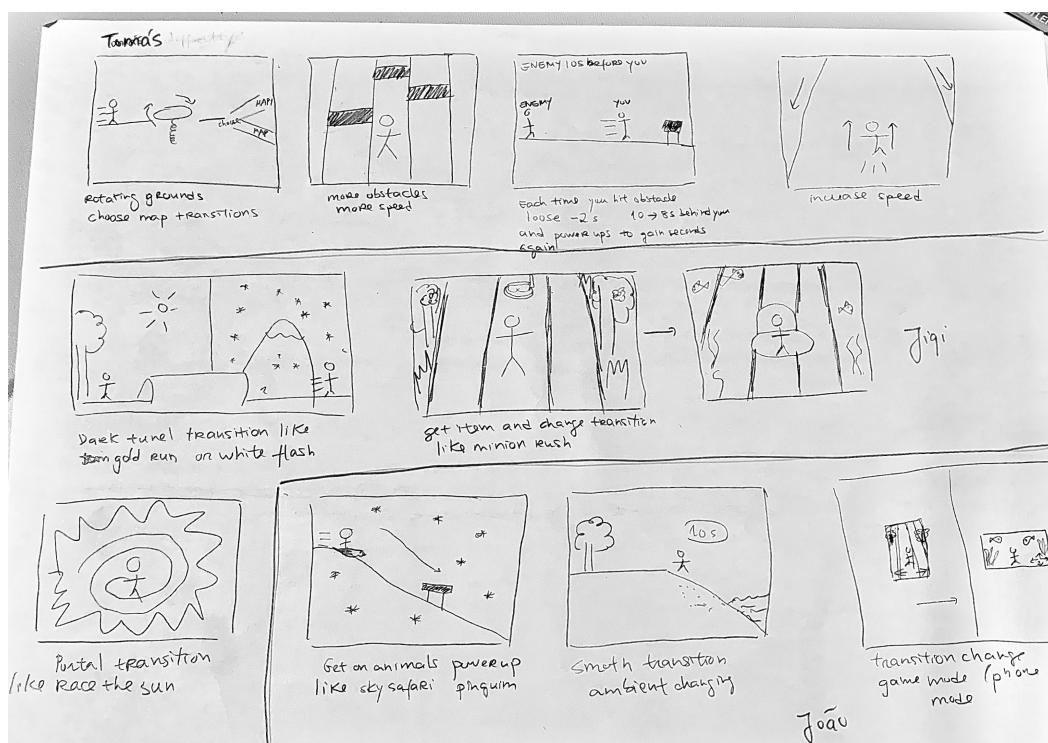
For a snowy environment, I searched for an endless runner I played years ago, *Ski Safari*. When you have slippery ground, especially if you're going downhill, we can expect a gradual speed increase. This idea could also work through the HMW question regarding game difficulty.

The last scenario I chose to think about was a free-fall situation. More difficult to incorporate in our game, which might force the change of the device orientation if played on mobile, but interesting nonetheless. Not only would it change the orientation, but, based on how skydiving works, the player could accelerate or decelerate the fall.

At this point I changed my focus to the literal change between spaces. After some googling about game transitions, I came across a definition that stuck with me: "A well-designed transition is something the player shouldn't even fully notice until they have moved onto the next segment/scene/part of the game". Taking that into account, the transitions between the environments could be something like a moment of peace or an adjustment period. Following the "10 seconds of space" theme, the environment should change every 10s, so what about we make the transition also 10 seconds? 10 seconds on land, then 10 seconds where the character gets to shore and dives into water, no obstacles, no stress, and then the next 10 seconds are underwater with all the mechanics of the new environment. This approach would be an answer to the players having difficulty adapting to the gameplay change, but could also disrupt the game flow, being too much of an interruption.

The opposite solution would be to use something like portals, where the change would be abrupt, with almost no interruption, but also no time to adapt to the new movement mechanic, which on the bright side makes the game more challenging for more hardcore players who want to know all the mechanics and display skill, and on the dark side makes the game more frustrating for more casual players.

## 1.2 Some sketches of our ideas



## 1.3 Decide who will sketch each part of the map

After each of our lightning demos, we discussed how we would tackle the sketching of the main ideas from our conceptual map. Instead of choosing to divide the tasks or swarm them, we decided to do a mix of both. Jiqi and João swarmed the sprint goal and figured out the transition between the different environments and mechanics, while Tomás tackled the upper part of the map, which we also considered important for the overall experience. Therefore, Tomás will work on figuring out how to implement the interactions between the enemy, the player, and the obstacles.

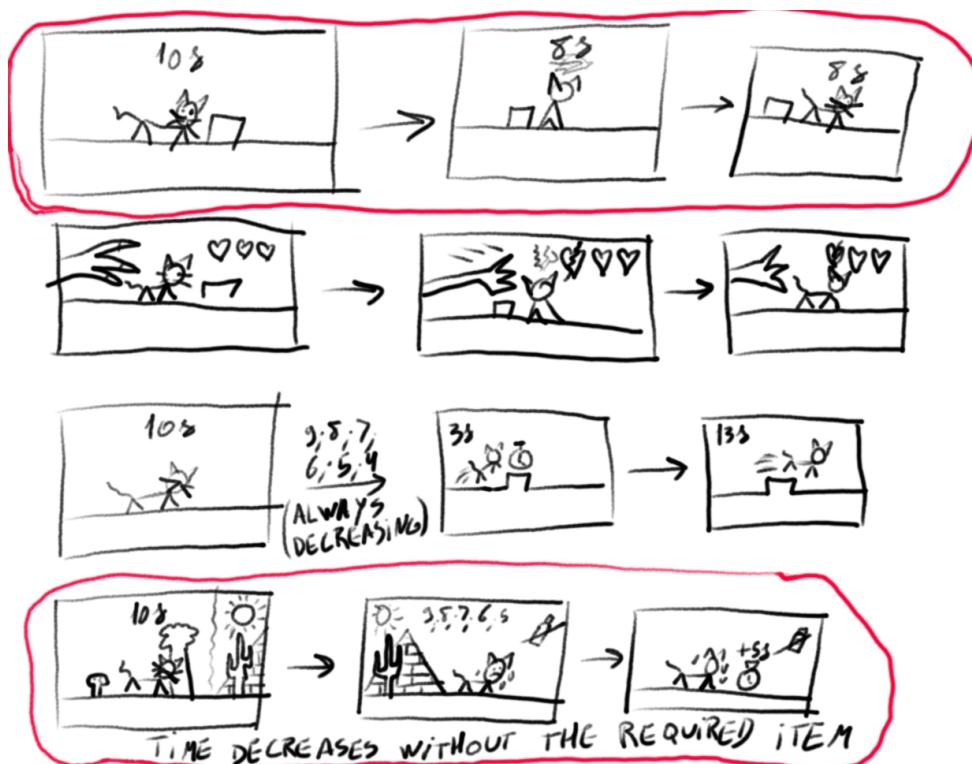
## 2 Sketch

### 2.1 Taking notes and create some rough ideas

#### 2.1.1 Tomás's idea

For this part of our sprint day, I started by rewriting all of the HMW questions we came up with in the previous session and writing some keywords regarding the ideas I liked the most from Jiqi and João's ideas.

After doing that, I highlighted the HMW I would like to focus on and started sketching a few ideas.



These quick sketches were:

- Having the time distance to the enemy decreases a set amount for every hit the player takes.
- Having three lives that would be claimed one at a time for every hit the player took.
- Having the clock always counting down, but the player could gain back 10 seconds for every stopwatch they catch until the clock runs out and they lose.
- In case the player has the choice to change maps if they change without catching the required

item, the timer starts counting down and the only way of surviving would be to find stopwatches to gain back some time.

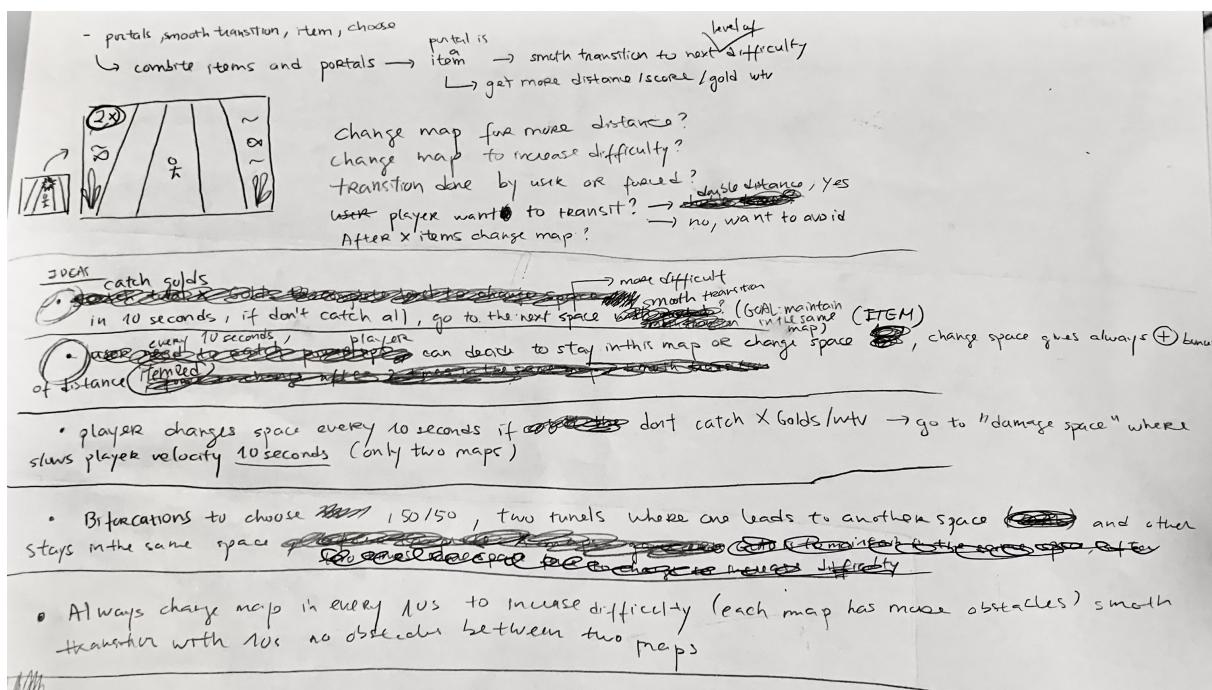
I chose the first and the second ideas as my main focus for the Crazy 8's.

### 2.1.2 Jiqi's idea

Considering that my task was to sketch solutions for how the transition between spaces is made, after evaluating all the ideas on the table and organizing them based on what stands out, I came up with some rough ideas:

1. The objective is to collect X something. If the player doesn't collect all the things within a certain time, they progress to the next map which is more difficult. Transitions between maps are smooth transitions, and the player's goal is to remain on the same map.
2. Every 10 seconds, the player has the option to either stay on the current map or switch to a new one by collecting a specific item. Changing maps always comes with a bonus.
3. The player switches maps every 10 seconds if they fail to collect enough gold. If they don't collect sufficient gold, they move to a "Punishment space" where their velocity is reduced for a period, making it easier for enemies to catch them. This approach simplifies the game to only two maps.
4. Player encounters two tunnel options (50/50 chance), one tunnel takes them to a different space, while the other allows them to remain in the current space. This gameplay mechanic adds an element of surprise, enticing players to transition to the next map to discover what awaits them.
5. The player changes maps every 10 seconds to increase the difficulty, the transition is made with a smooth transition that involves no obstacles.

I spent some time thinking it over, and after some consideration, I decided to go with the first and second ideas for the Crazy 8's.



### 2.1.3 João's idea

My task was centered around the environment-specific gameplay, basically how to make the player feel they really are in a different environment, not only for the visual look of the game but for the different mechanics.

After reviewing the work we've done until now, I came up with three approaches:

1. The movement mechanic changes to adapt to the new environment, on the land you can only move on the horizontal plane, jump at most, and underwater you can move freely in any direction, for example.
2. The obstacles the player has to overcome change with the environment, like a snake on land, a long but short obstacle, and a school of fish underwater that has a narrow space to pass in between.
3. Both the items found and their effect change between environments, like a skateboard to move faster on land that you would lose when you go underwater and fins that let you swim faster but make you slower on land.

Looking at those ideas, the first and third looked the most interesting to think about.

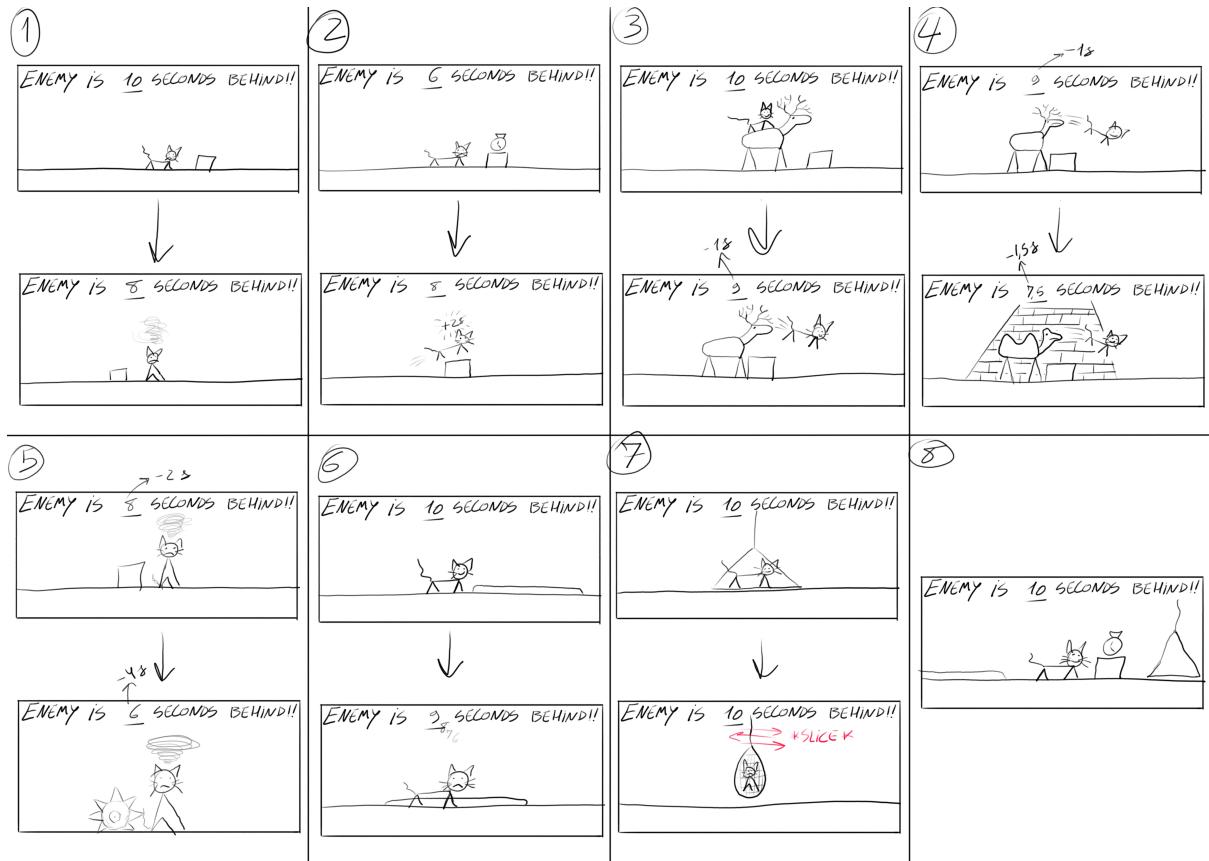
In a perfect world where we would be building the whole game, we would have a few different environments, ten of them if we wanted to emphasize the theme. Unfortunately, for the purpose of the game sprint, we have to stick to two. For that reason, and since we have yet to define which ones we are gonna stick with, my approach for the crazy 8's will be to focus on the mechanic, and not the environment itself, those being movement/navigation and items/effects.

## 2.2 Crazy 8's

### 2.2.1 Tomás's Crazy 8's

I then drew one crazy 8 for each of the two selected ideas.

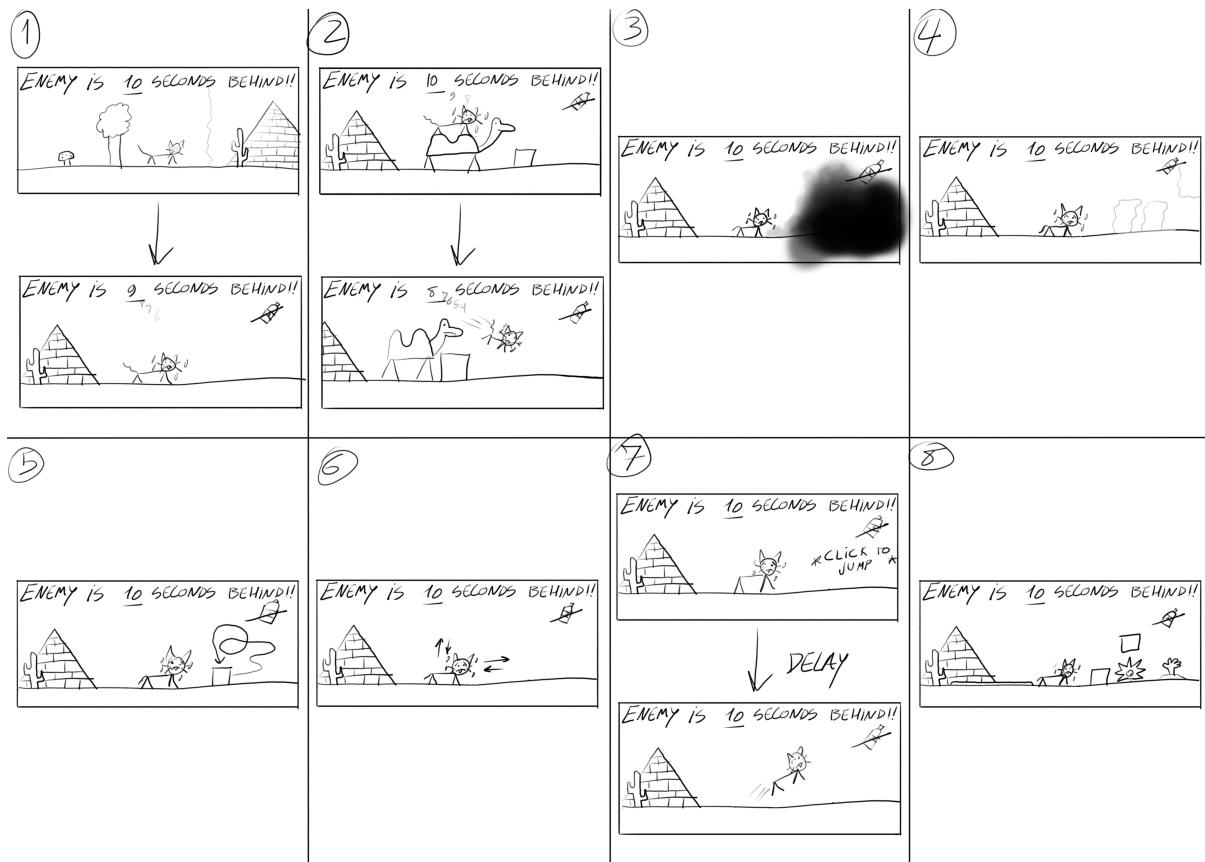
One for the first idea:



Where:

1. Is the initial idea with the added risk that in harder levels, the time reduced per hit would increase.
2. Is taking the idea of the stopwatch and applying it to this concept. Catching a stopwatch would restore half of the total time lost.
3. Riding a mount would reduce 1 second when you hit an obstacle, no matter the level. You'd lose the mount after one hit.
4. Hitting an obstacle with a mount would reduce half as much time, compared to hitting an object on foot. Harder levels would reduce more time than easier levels.
5. Some obstacles would remove more time than others.
6. Slime obstacles would slow you down, allowing the enemy to get closer for a certain amount of time.
7. Some obstacles would trap you in place and you'd have to interact with them to escape. The enemy would get closer while you're trapped.
8. Is a mashup of ideas 2, 5, 6, and 7.

After that was complete, I drew the second crazy 8:

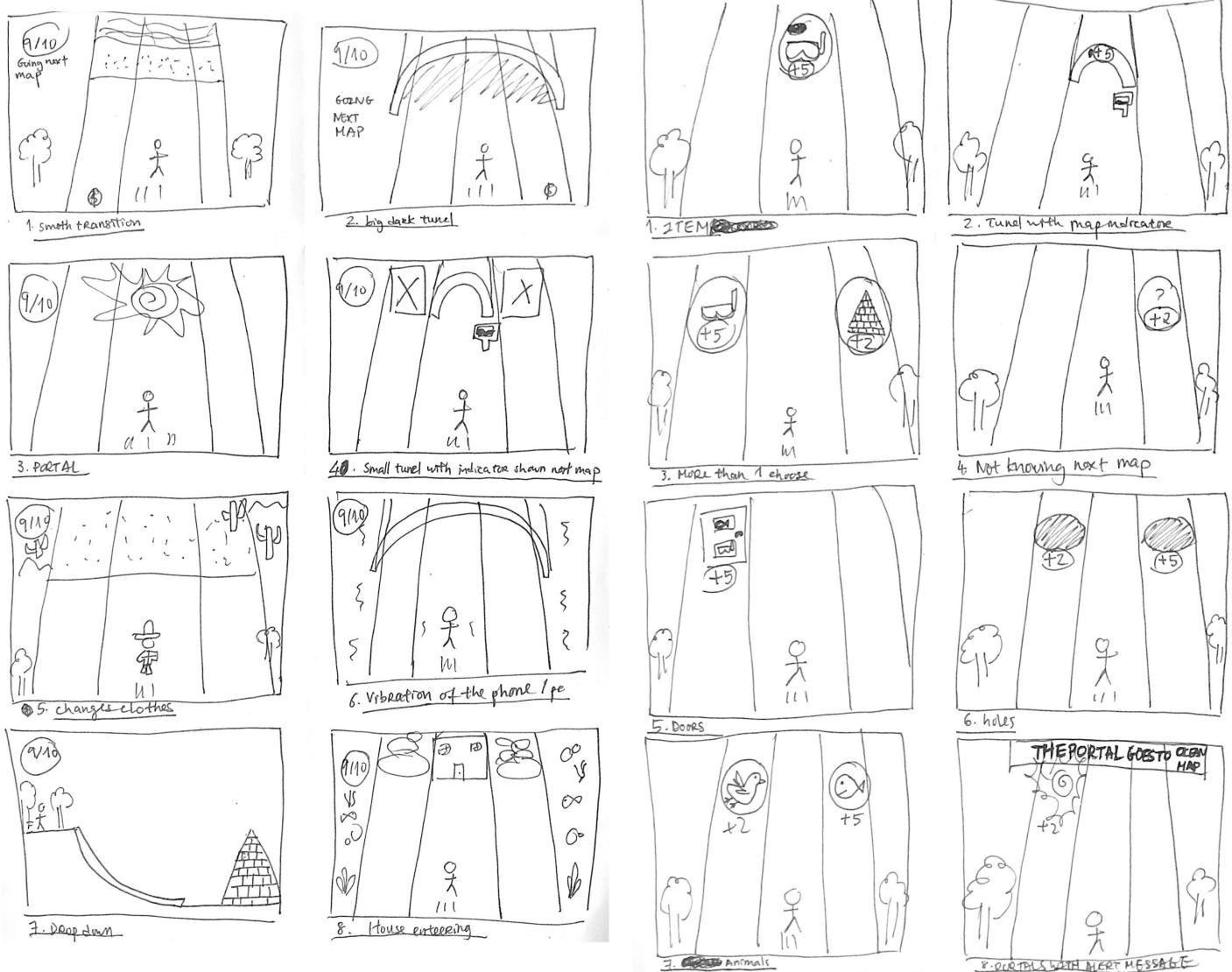


Where, if the player has a choice in changing levels and they move to the next level without the required item:

1. The clock would start decreasing until they found the required item. Stopwatches could regain some time, but the clock wouldn't stop counting down.
2. Riding a mount would reduce the time lost due to not having the required item by half and would grant the player immunity to 1 hit.
3. A "fog" would cover part of the screen making it more difficult to prepare for upcoming obstacles.
4. The player would start seeing mirages and wouldn't be able to tell which objects are real and which are the mirages.
5. Static objects would start moving erratically.
6. The player model would start moving on its own, making it more difficult for the player to avoid obstacles.
7. There would be a random delay to the player's inputs
8. The amount of obstacles would be much larger than if the player had the required item.

Taking these two crazy 8s into consideration, I created my storyboard by mixing my favorite ideas, that is, the 8<sup>th</sup> idea from the first crazy 8, and the 3<sup>rd</sup>, 4<sup>th</sup>, and 5<sup>th</sup> ideas from the second one.

## 2.2.2 Jiqi's Crazy 8's



The left side is dedicated to my first idea, which is about collecting X something. My main focus here is on understanding and improving how transitions between spaces in this idea work.

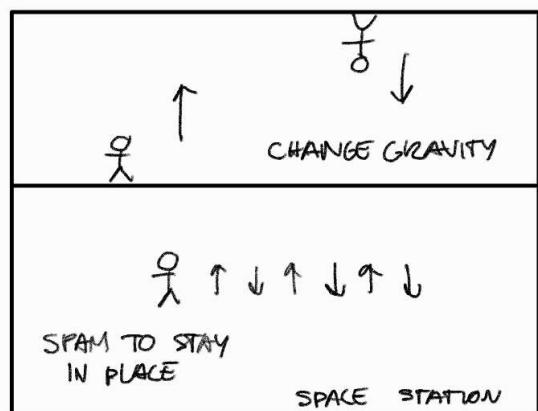
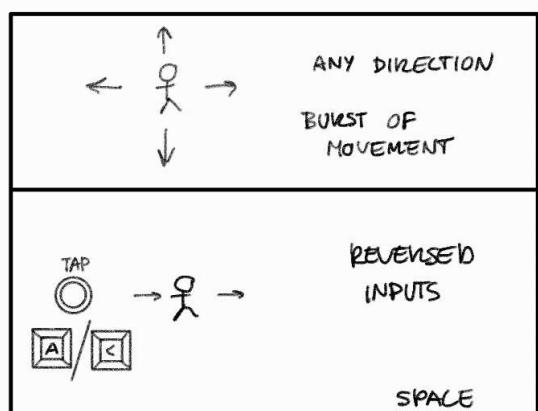
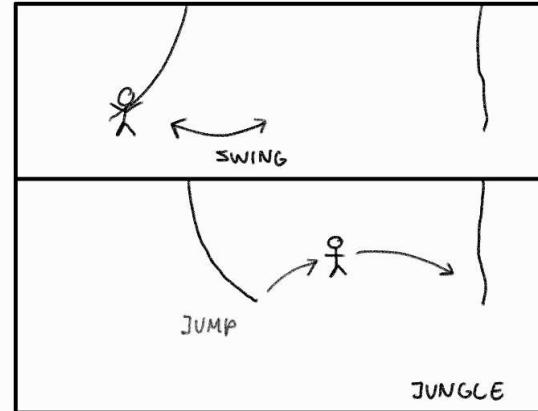
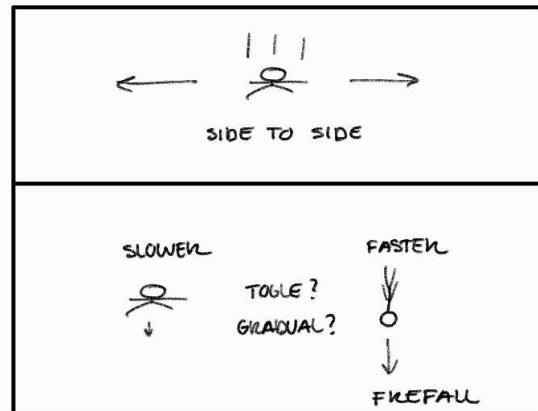
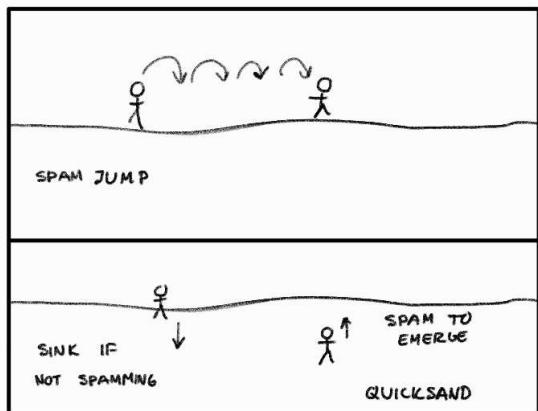
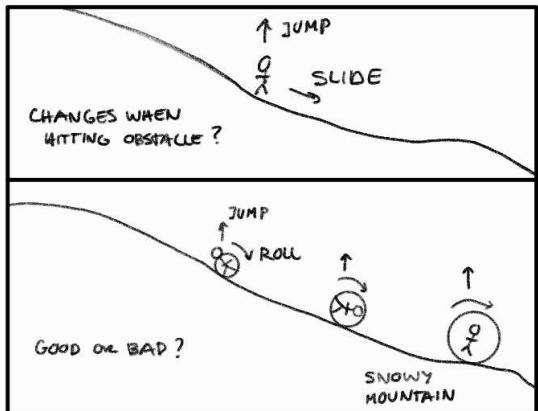
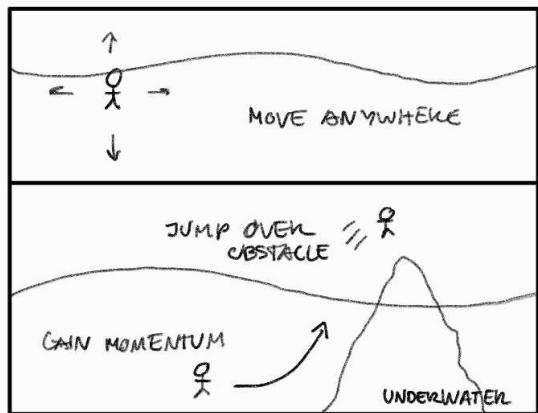
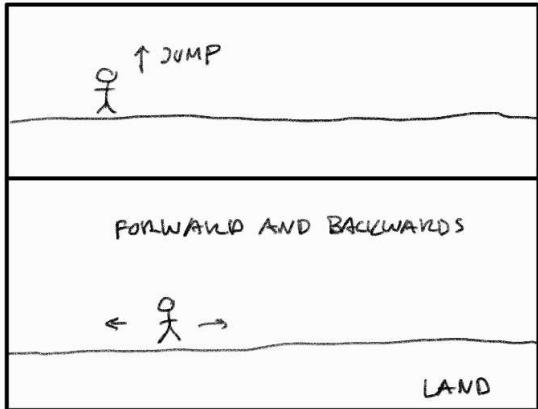
Therefore, I created the first Crazy 8's that included:

1. Implementing smooth transitions between spaces,
2. Dark tunnels,
3. Portals to the next space,
4. Small tunnels with map indicators,
5. Changing clothes to signal a map change,
6. Utilizing phone or PC vibration as a transition element,
7. Incorporating a sliding mechanism,
8. Implementing a house structure as an entry point to the next map.

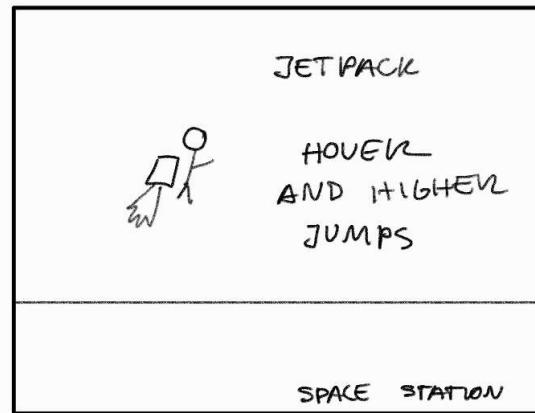
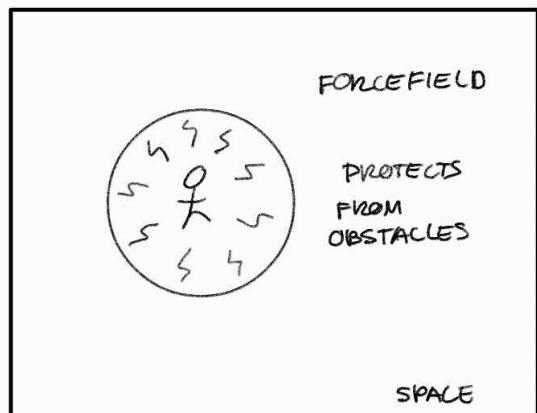
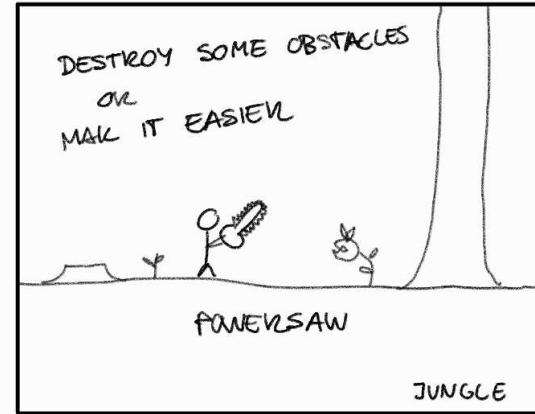
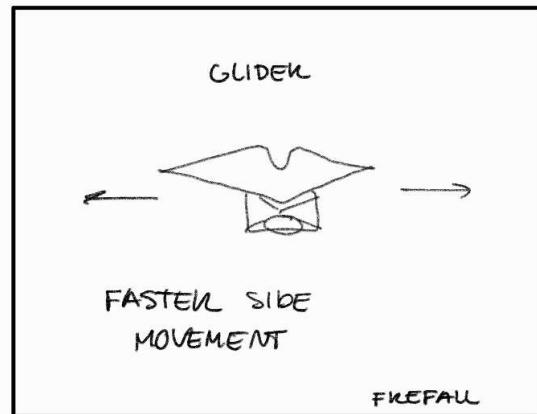
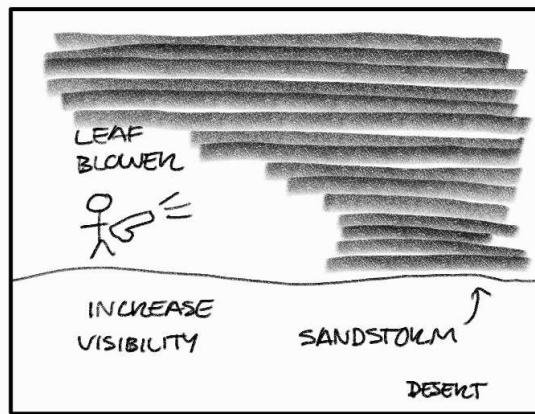
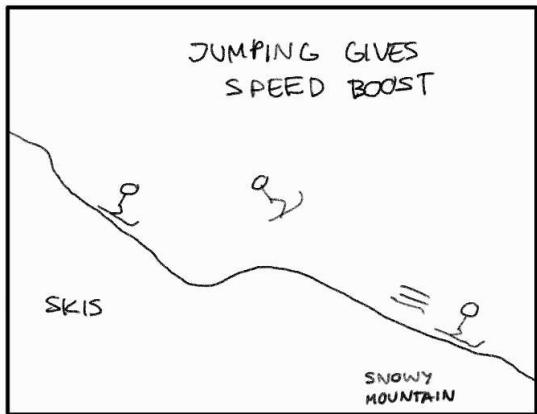
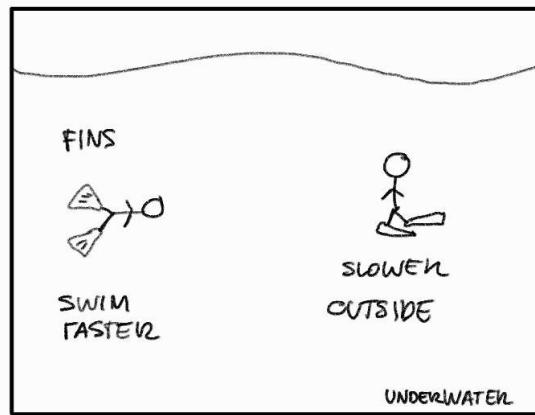
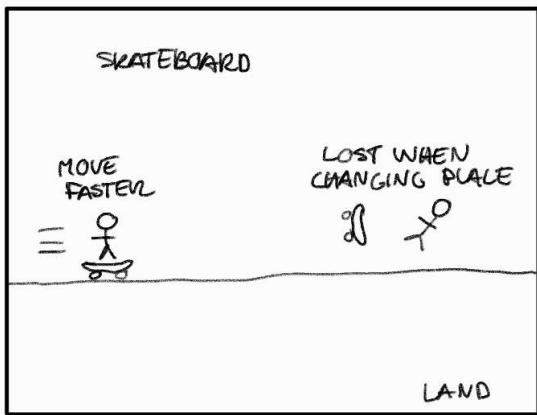
The right side is focused on my second idea, where the player has the option to either remain on their current map or transition to a new one when they intend to collect a specific map-changing item, which also comes with a bonus.

1. Collecting items related to the next map,
2. Tunnels with indicators for the next map,
3. Providing multiple item choices,
4. Unpredictable map-altering item,
5. Doors as elements for transitions,
6. Using holes to add an element of surprise about what map is coming next,
7. Animal-themed items as signals for the next map,
8. Portals with on-screen alert messages for map transitions.

### 2.2.3 João's Crazy 8's



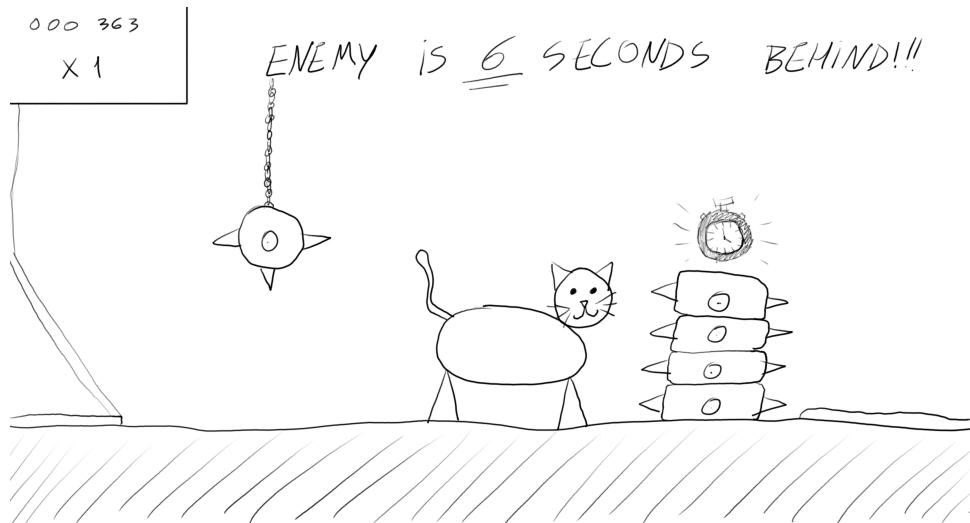
The first one is focused on the moving mechanics. The point is to make it feel different, but it can't be too complicated. Some ideas change the movement restrictions, others change the controls completely.



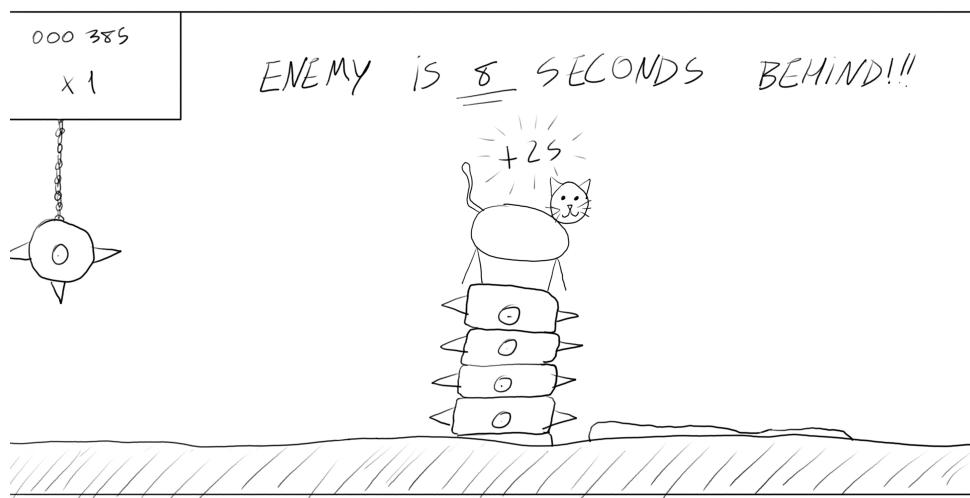
The second one is focused on items and their effect on the player. The items make it easier for the player to navigate, some disappear when changing environment, others give a disadvantage when this change happens.

## 2.3 Storyboard

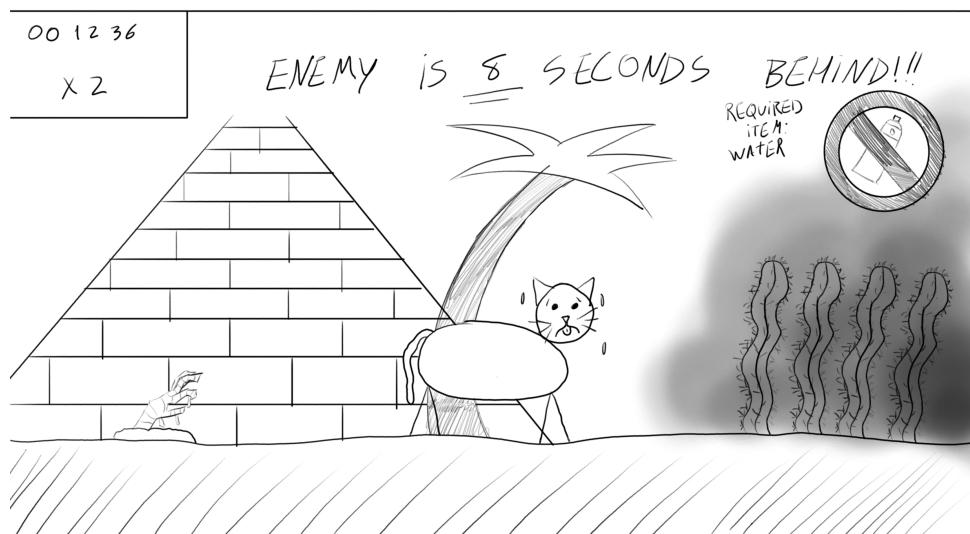
### 2.3.1 Tomás's storyboard



There are several types of obstacles that have distinct effects and reduce different amounts of time to the total remaining time



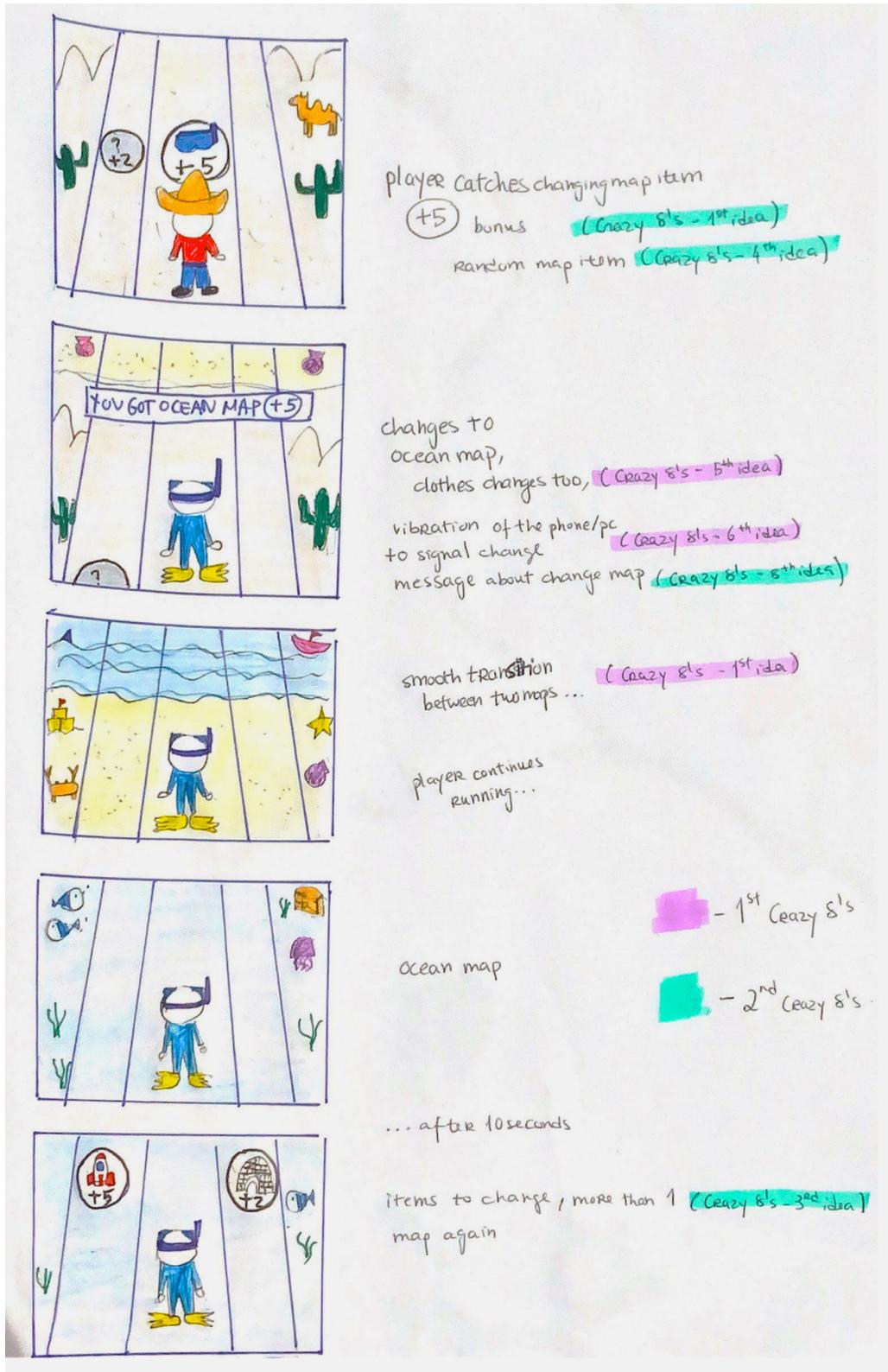
Stopwatches restore half of the total time lost



You can opt to go to the next level if you want, but without the required item, you will face problems like mirages, fog, or moving obstacles, all of which will make it more difficult to survive

### 2.3.2 Jiqi's storyboard

Taking into account the ideas from both sets of Crazy 8's mentioned above, I have incorporated the ones that I found most appealing into the following storyboard. (1<sup>st</sup> Crazy 8's ideas - 1, 5, 6, and 2<sup>nd</sup> Crazy 8's ideas - 1, 3, 4, 8). To make it easier to understand, I've included references to the corresponding idea (from which Crazy 8's) in the storyboard images. Additionally, I've added color to the storyboard for improved clarity.



### 2.3.3 João's storyboard

For the final storyboard, I chose to combine the ideas corresponding to the Land and Underwater environment from both crazy 8's. The Player is on land for 10s where he can jump and slightly walk sideways. He can pick the skateboard to upgrade his movement.

On the 10s transition the character enters the water, and loses the item.

The next 10s are spent underwater where the player can freely move up and down and slightly sideways, and gain momentum to jump out. He can pick the fins to upgrade his movement.

