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COURSE CODE: WSOA3003

ESSAY TOPIC: **Exam Reflection Group 9**

Plagiarism Declaration
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- I have correctly acknowledged all direct quotes and paraphrased ideas. In addition I have provided a complete, alphabetised reference list, as required by the Harvard method of referencing (described in the Student Handbook).

· I have not allowed, and will not allow, anyone to copy my work with the intention of passing it off as his or hers own work.

· I understand that the University of the Witwatersrand may take disciplinary action against me if there is a belief that this is not my own unaided work or that I failed to acknowledge the source of the ideas or words in my writing.

Signed: Tenisha Moodley

Date: 25 June 2021

Table of Contents

Deez Soulz 'N Holez

Intention

The intention for this game was to create a single player, strategy game that effectively communicates all elements of the game to the player, such as the data design, level design, feedback design and the feedback loops of the game. The game is an adventure mini golf, also known as Putt-Putt, inspired game which requires the player to manoeuvre spherical objects such as balls around a strategically designed level in order to get one of the balls into a hole.

The game was originally intended to inspire strategic process both from the player and the game developer because of the common interest of strategic puzzle solving games, and the game even took reference from games such as Mario Golf, Ping-Pong, Billiards and Adventure mini Golf. These games all show a common theme of a designed course that strategically places level design elements to force a player to move their avatar through the space, using the controlled shooting typed main mechanic. So with reference, this game intends to be just like that.

The main focus of this game therefore becomes the level design and the chance to explore the main shooting mechanic. Research of level design shows that levels are primarily used to progressively introduce difficulty to the game, while simultaneously influencing the player to participate with the main mechanics, the newly introduced mechanics and the genre of the game to its fullest.

For my game, I aim to try to slowly familiarise the player with the patterns of the game and hopefully then show how my main mechanics work and what type of fun the game provides with as much agency and as fewer words as possible.

Process

The game follows a formula designed after months of processing how to implement different levels of data into a game, ranging from the data design to the feedback loops of the game. The game follows the Mechanics, Dynamics and Aesthetics (MDA) framework model which means that the game is developed with the main rules, main systematic reactions and main designed feedback in mind (Hunicke, LeBlanc, Zubek, 2004).

Using this main system of development, the development process is, although not smooth or a fluent process like most iterative processes are not, but it is more easily definable because the order of development is distinguished. First the main mechanic was established, and then

the systematic reactions from that mechanic are defined and then lastly the aesthetics from both the mechanics and the dynamics are explored **(See Figure 1)**.

The Feedback Design of the game was, with a game regarding majority geometric shapes such as this, kept simple with colour design and User Interface (UI) elements to compliment the simplicity of the game's theme. The Data Design of the game is mainly focused on during the development of the ability ball, the ball which is used to manoeuvre the objective ball around the course and into the goal. This ball has numerous abilities, but it has limits to how it can be used and how many times it can be used and these requirements needed statistics that calculated the systematical responses when values lead to differing states such as the end state. The Level Design is the second most important factor to implement into the game as the game followed a similar process to that of adventure golf which provides a required number of courses to the player, and in the same way our game provided a number of levels to the game. The Feedback Loops, or systematic loop design, of the game maintained the main mechanic's core function which is to repeatedly shoot the ball to eventually reach the goal. However, with every push hopefully closer to the goal, the closer the player got to failing as the player is left with a limited number of shots, making this core loop a positive feedback loop which increased the speed of the game play.

Reflection

My game's design almost completely follows the previous plan of the game, however a few changes were made regarding the trajectory line, starting conditions, scoring system, sinking conditions and other movement mechanics and as previously mentioned in **figure 1**, other mechanics were added as well **(see figure 2)**. The game originally intended to have a trajectory line that allowed the player to get a prediction of where and possibly how the ball they used would react around the given course. Furthermore, the previous game design required the player to drop the balls into a space where they can choose to use the ball from. After both primary and secondary play testing however, both of these changes were removed from the game.

Originally, the trajectory line seemed like a permanent idea, unlike the scoring system which was undefined even after the project plan was completed and was therefore left up to the interpretation of the game developer, and a part of the idea did remain. As seen in **figure 10,** the drag and shoot main mechanic has a point to it that hints at the players direction while the multi coloured drag line renderer gives the player a hint of the power behind the ball. This acts as the main source of trajectory because after struggling to implement a further trajectory line that extended past the line renderer passed the ball without it disturbing the image of the ball and breaking game flow, has proven difficult to accomplish with the limited knowledge of

trajectory lines I have. However, this wasn't a big set back because internal play testing, and eventually external play testing, proved that the game was enjoyable both without the trajectory line and with one, but the consensus showed that without the line was better and therefore the line was not added **(see figure 8)**.

The original project plan also described that if the ability ball enters the goal hole, then the game ends or some bad condition is acknowledged, however I changed this concept as well by preventing the ability ball from being sunk at all **(see figures 16 - 17 to see all of the bellow stated changes)**. This was decided because the level design for this game are both short and quite complex and the main goal is for the player to get the objective ball into the hole not necessarily prevent the ability ball from entering so by having the ability ball able to sink, it would mean giving the player less chance to engage with the true objective of this game.

Furthermore, the original project plan also planned for how the one ability, the phase ability, would be able to phase through one wall and then lose its phase ability, but because I decided to use a different shot counting method than was originally planned as well, this ability was left being able to constantly phase through any wall that is phase-able. To elaborate on the aforementioned shot counting system, the original plan was to give each ability a counter before it runs out and the ability can no longer be used, however I changed it so that the ability ball itself has a limited number of shots but the player can use which ever ability is present to them as many times as they want within the confounds of the ability ball shot count.

Lastly, I changed the project plan from allowing the player to control where the ball is positioned in each level because I felt this didn't promote strategic thinking as much as we originally thought it would, so designing levels where everything is set and the player has to work around this worked very well concerning the promotion of strategic processing of how to use the mechanics within the provided level.

My project plan constantly changed along with the iterative process of developing the game as well as while regarding the limitations, affordances and requirements of the game. The game was required to be done in the matter of almost 4 weeks, with the affordances of time and with how the game was restricted due to my limited knowledge on game design, the game suffered a few attentions to detail. My knowledge at the moment allowed for certain milestones and tasks to be met and others that weren't, such as the trajectory line. Within the old project plan, it was decided to allow individual developers to decide which abilities they want to work with, I decided to work with the normal ability, phase ability and the sticky ability **(as seen in figure 2).** Furthermore, I also decided to add a bit of a narrative, the way Mario

Golf does. The simple help the character in distress by getting through these obstacles, is a common type of narrative found in these types of level bad games so the choice to use the character, Siphy the Soul get the chance of reincarnation was implemented for aesthetics purposes **(also seen in figure 2)**.

I had various problems while developing my game, ranging from the misfiring of the drag and shoot mechanic to the settings page only allowing volume change in the first scene and then in none of the other scenes. Most of my problems were fixed or found a solution to, however these two problems, were unable to fix. The drag and shoot mechanic misfiring is a much more severe error than the settings menu not working so while I tried to find different solutions for the error, such as forcing the velocity of the ball to zero faster so the player doesn't click the mouse impatiently waiting for it to stop and then accidentally misfiring because of it, or even disabling the script of the drag and shoot mechanic until the moment the ball's velocity was zero, I could not get any of these solutions working which eventually lead to me warning the player about the error in the game **(see figure 16)**. However, after trying to add a 'DontDestroyOnLoad' method to my settings menu to try solve why the volume would not change in any other scene except for the first scene, until I realised it was the fact that the music itself that was already using the same method and was therefore not being allocated to the volume slider in the settings menu that was the reason the volume didn't work, I simply decided to leave the error as such due to its lack of severity and thereafter focused my time on a more crucial tasks.

Lastly, the original project plan only features a pause, main and quit menus, however I added a start menu, settings menu, win menu, lose menu and credit scene in order to add a bit of feedback design and professionalism to the game, to emphasise that it is a game rather than just a prototype of one (even if it is considered a prototype of one).

Play Testing

I was aiming for players to enjoy my game from a strategic point of view. I want my players to engage with the puzzle elements of the game, struggle with them and then feel elated after they succeed. After play testing, the results were satisfying as most of the play testers, while some were my friends who knew the effort I put into the game and therefore probably appreciated it more with understanding, the ones who I did not know still provided satisfying response of similar views to my aim of fun. **Figures, 3 - 10**, show the play testing results which show how the players enjoyed the game **(see figure 6)**, what problems arose **(see figure 5)** and what elements of the game could be improved on or developed **(see figure 4)**. While play-testing the fact that the player can use all of the ability shots to get the objective ball's one last resort shot to get the ball in, was actually a break in the game because the objective ball is usually positioned very close to the goal without obstacles obstructing it, but it was left

as is because only one person thought of it and it seemed like an interesting mechanics to leave into the game if any other players find it out too.

Level Design

Each scene starts with a startup screen **(see figure 15)**, this might come across as inefficient because of how it breaks game loops which are the main source or promoting game flow, however like golf, and unlike games such as ping pong or pinball, the game is not consecutive. There is always a pass of time between each course, giving the player time to recollect and consider the way they've played the game, the way the game works and how the game could possibly challenge you next which promotes strategic play within a puzzle solver like my game. So, similarly I added the chance for the player to give up, go back and proceed with every level not only to promote player agency and interaction, but also to make a more believable digital version of a mix and match ping-pong-esque, but also Putt-Putt styled game.

The level elements that were used:

- Solid wall: Used because it is a main element of an adventure golf game such as this. Having the plain walls that do nothing but repel objects due to physics provides room for the exploration of the core mechanic as well as for the other types of obstacle elements that could be added.
- Moving wall: Used because it brings a level of difficulty to the game that seemed interesting
- Wall switches: Used because like the moving walls, they brought a level of difficulty, but also forces the player to stay focused and engaged during the levels and to not just release shots randomly and hope the goal is reached.
- Phase wall: Used because it forces the player to understand the phase ball mechanic by providing a means for using the phase ball mechanic.
- Sticky wall: Used because like the phase wall, it helps provide reason and understanding to the player about the sticky ball mechanic.

The level elements that were removed:

- Breakable wall: Was removed because the breakable ball ability was disregarded due to lack of time to implement the level and ball designs for that ability.
- Gravity area: Was removed because it was difficult to get the ball to move up and down within a zero gravity space without the ball either loosing velocity or just looking strange and not working the way it was perceived in my head.
- Collectables: Was removed because even though they are a great sense of direction and communication to the player as well as a successful scoring system besides the simple stroke counter used in the game, the lack of time prevented me from implementing it.

The levels **(see figures 18 - 20)** themselves were designed in specific ways to help the player understand the game such as in **figure 12**, where the instruction on how the player should switch between ability balls, and the instruction, the fact that the ability ball currently active is the normal ball, and the position of the phase wall, all force the player to press the keys to make the instructions go, away and to allow the ball to get through the wall and proceed with the game.

References

Hunicke, R & Leblanc, M & Zubek, R. (2004). *MDA: A Formal Approach to Game Design and Game Research*. 1-5. AAAI Workshop.
Available from URL: https://www.aaai.org/Papers/Workshops/2004/WS-04-04/WS04-04-001.pdf

Appendix

Figure 1 A Table showing the different game elements implemented and how they were implemented

	What Was Implemented	How It Was Implemented
Mechanic	The Drag and Shoot Movement	Using the transform.position of the mouse when clicked and then applying force to the letting go of the mouse. The mechanic only works when the ball's velocity is zero.
Mechanic	The player can only shoot one ball at a time	As long as a ball has a shot count greater than 1, then that ball gets the drag and shoot script while the other ball's script is disabled.
Mechanic	Phase Ball Ability	Used an array to find all the objects tagged "Phasewall". Used the Physics2D.IgnoreCollision method to have the balls collider ignore all walls with the tag.
Mechanic	Sticky Ball Ability	Used a collision collider methods to stick to walls with the "SolidWall" tag. Used a parent and child transform method to allow the sticky ball to become a child of a sticky wall object on collision.
Dynamic	End States	When neither the ability ball or the objective ball have any shots left to use. Also if either ball goes into the dead zone.
Dynamic	Start State	Player always starts with the ability ball. This ball has numerous abilities that the player can switch between using the 1, 2 and 3 keys. Needs to help the objective ball, Siphy, into the goal.
Mechanic	Objective Ball	Objective ball is only activated after all ability ball shots are lost and the level is still not won, and it only ever has one shot as the last resort shot. This ball has to get into the hole, and correctly is narrated as the soul Siphy.
Mechanic	Normal Ability Ball	An ability of the ability ball which is just a solid ball with normal physics.
Mechanic	Goal	Is a trigger that allows the player to proceed to the next level using unity's scene management methods
Mechanic	Deadzone	Immediate death if any ball goes in.
Dynamic	Scoring System	Stokes counter that counts the number of times the player has successfully drag and shot a ball.
Mechanic	Wall Switches	Uses an animation that moves the wall's transform once any of the balls have collided with the switch.

	What Was Implemented	How It Was Implemented
Aesthetic	Animations indicating which ball is currently active	Highlights the different balls, how many times it can be used and their purpose using UI text as well as animations.
Aesthetic	Panning into the course to give a preview	Inspired from Mario Golf where the camera pans over the course before making it's way to the player, although they do this because of how large the courses are and mine are not and can be completely seen in at one time, the aesthetic of it is why I added it to the game.
Dynamic	Moving Walls	Walls the move using animations. They sit still at first until they are activated by the player.
Aesthetic	Narrative	The player, the soul guide or side kick, needs to help the soul, Siphy, get to the gates of resurrection.

Figure 2 A Table showing why game elements were implemented

What	Why was it implemented
The Drag and Shoot Movement	Drag and shoot because this was the most logical way I could think of to create a golf hitting like movement within a digital space 2D space without actually creating a virtual Putt.
The player can only shoot one ball at a time	This is to avoid having the objective ball and ability ball being shot at the same time from the same point which would cause confusion and not promote strategy unless that was the aim of the game, which it was not.
Phase Ball Ability	The phase ball was chosen over the breakable ball because I already knew how to implement the Physics2D.IgnoreCollision method and wanted to use it.

What	Why was it implemented
Sticky Ball Ability	The sticky ball becomes a child of moving sticky walls and this decision was influenced from a play tester **(see figure 4).** Sticky ball is an interesting ball ability that slows down the game for the players by sticking to any wall it touches besides phase walls.
Objective Ball	It only has one shot to add a safety net for the players who feel frustrated with constantly being unable to manoeuvre the ball into the goal, so by allowing this, the player gets one shot where it's guaranteed to succeed if they aim the ball right.
Deadzone	To ensure that the player does not just randomly shoot the ball. Forces strategic thinking.
Scoring System	To give the player a reason, other than interest in the game's mechanics, to play and challenge themselves.
Animations indicating which ball is currently active	Give the player feedback design as to which ball they can control at a time
Panning into the course to give a preview	Allows the player to see where the goal is before they see everything else so they know where they are aiming for before the level even starts.
Moving Walls	The standing still until activated allows them to be used both as solid normal walls and as moving walls which changes the level exponentially, almost creating two levels winton one

Figure 3 showing play testing results of external/secondary play tester who brought attention to the sticky ball mechanics development

Play Testing Questions:

1. Rate the game out of 10
2. How is the movement feel? Displacement? Smooth? Unsatisfying?

3. Would a prediction/trajectory line in front of the ball be useful? If so then why?
4. Was the game fun? If so what made it fun?
5. How would you describe the game to someone else?
6. How long was game play and where did you stop in the game?
7. Were there too many words describing the game that you read over them?
8. Were there any bugs?
9. Any Other comments?

Figure 4 showing play testing results of external/secondary play tester who brought attention to the sticky ball mechanics development

Cheyenne Peter - Game Development student

1. got confused wth the drag and shoot at first but then got it after a few tries

2. got the second level quickly
3. figured pause page out without having to be told
4. might have to put in another wall in level 2, they struggled with this one
5. got level 2 in eventually by strategising the walls
6. started familiarising with the different ball mechanics in level 2

7. learned something new: force stop the velocity to zero
8. Chey struggled a lot with level 3, find a way to make it easier
9. can finish level 3 in 3 moves

10. figured out there was a green ball after seeing the green wall
11. objective ball is stuck on it's turn to shoot
12. maybe should move the deadzone a little so the green ball doesn't die if stuck to the green wall
13. Chey doesn't like the sticky ball because in level 4,
14. level 4 needs more ability ball moves
15. add normal wall to level 4
16. sticky ball should be able to follow the green platform
17. make the switch entirely disappear after activated
18. elongate black wall a little

Questions

1. Rate the game out of 10
    1. player engagement and stuff is an 8

2. How is the movement feel? Displacement? Smooth? Unsatisfying?
    1. Overall its fine
    2. when pulling back, it could be a tiny bit faster

3. Would a prediction/trajectory line in front of the ball be useful? If so then why?
    1. finds the way it is right now perfectly fine

4. Was the game fun? If so what made it fun?
    1. yes, the tension builds and getting to the end goal is satisfactory

5. How would you describe the game to someone else?
    1. Something golf
    2. spirits golf
    3. 2d golf
    4. extremely frustrating at times

6. How long was game play and where did you stop in the game?
    1. 15 - 20 minutes
    2. got to the end

7. Were there too many words describing the game that you read over them?
    1. no

8. Were there any bugs?
    1. yes many

9. Any Other comments
    1. Nice difficulty progress
    2. might want to add when the player shoots

Figure 5 showing play testing results of external/secondary play tester who brought attention to the most problematic error in the original game that had not been recognised in any other form of play testing before then

Payal Chana - Game Development student

Problems

- deactivate ability ball? remove the switch ability script from ball
- when switching ability balls, the ball loses shots
- Solution: the balls were subtracting from the counter when the phase ball was activated such as when the sticky ball hits the sticky wall. However, this along with the losing shots with each drag and shoot was messing with the counter so the decision to leave the shots to just the drag was decided. this way the individual shots and the general shots didn't mess with each other.

Level 3

- Pie struggled
- Just waste the ability balls to use the objective ball? Find a solution or not necessary ?

level 4

- ability ball doesn't have enough shots
- still doing weird thing where ability ball loses shots
- the text for the balls is weird too
- when pressing two it goes to siphy
- when sticky ball sticks it goes to siphy

Part Two - Payal Chana

Level 1

- flew through

Level 2
- flew through
- still having the ability balls losing shots thing
- got it in one go

Level 3
- pie got it in one go

Level 4
- struggled a lot with this
- pressing on 2 is a problem
- Mentioned not to give the players

Questions
1. Rate the game out of 10
    1. 6 with bugs
    2. 8 with bugs

2. How is the movement feel? Displacement? Smooth? Unsatisfying?
    1. nice
    2. decrease the wait time between each stop of the ball, like increase the drag

3. Would a prediction/trajectory line in front of the ball be useful? If so then why?
    1. would be nice, but it works without it
    2. she actually quite liked it without it

4. Was the game fun? If so what made it fun?
    1. yes, the failure made it fun
    2. when you finally succeed is also fun

5. How would you describe the game to someone else?
    1. reincarnation

6. How long was game play and where did you stop in the game?
    1. 17 mins got to the middle of level 4

7. Were there too many words describing the game that you read over them?
    1. no not many words
    2. move the text higher on the start page
    3. pie wanted to click the start text

8. Were there any bugs?
    1. yes mots definitely

9. Any Other comments?
    1. its was fun, I really liked it

Figure 6 showing the final play testing results of the game from an external/secondary play tester

level 1 and 2 flew through without problems

level 2

- tried to get the ball in one shot to challenge and well as to get within par
- if die and get in hole at some time then dying takes priority

Level 3

- flew through

Level 4

- the sticky ball deforms after it sticks once
- change animation to make it slower
- black wall shorter - I decided against it
- grey wall remove
- dead zone slightly lower
- make green wall shorter

Questions

1. Rate the game out of 10
    1. 7/10

2. How is the movement feel? Displacement? Smooth? Unsatisfying?
    1. good but it takes a while to respond
    2. shoots in direction

3. Would a prediction/trajectory line in front of the ball be useful? If so then why?
    1. so you would like a trajectory line

4. Was the game fun? If so what made it fun?
    1. yes because ball game bias

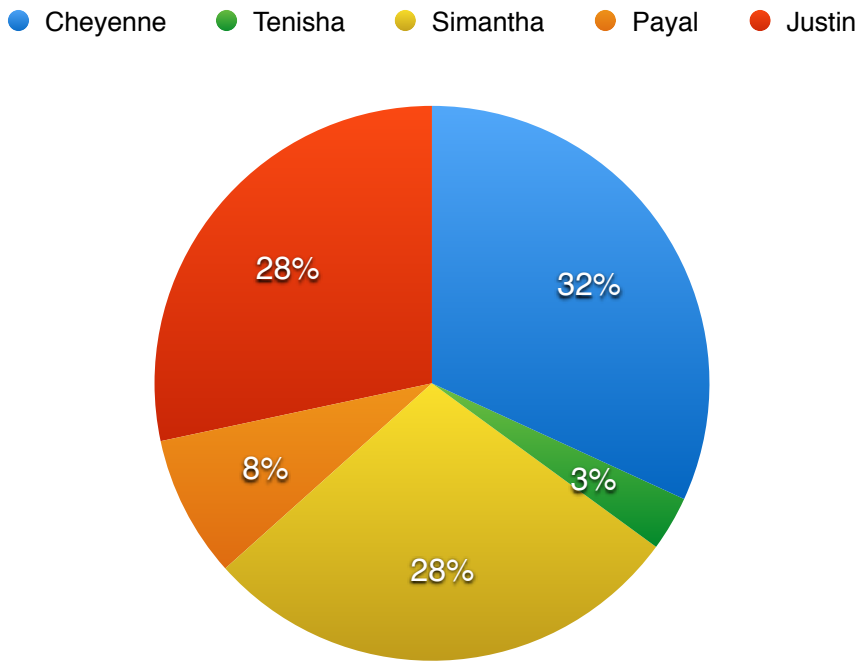
5. How would you describe the game to someone else?
    1. mini golf but instead of golf balls you shoot a soul and instead of balls
    2. putt putt but make it super natural
    3. adventure ball in purgatory

6. How long was game play and where did you stop in the game?
    1. 10 - 15 minutes

7. Were there too many words describing the game that you read over them?
    1. no, it's pretty good
    2. most of it was learn through doing

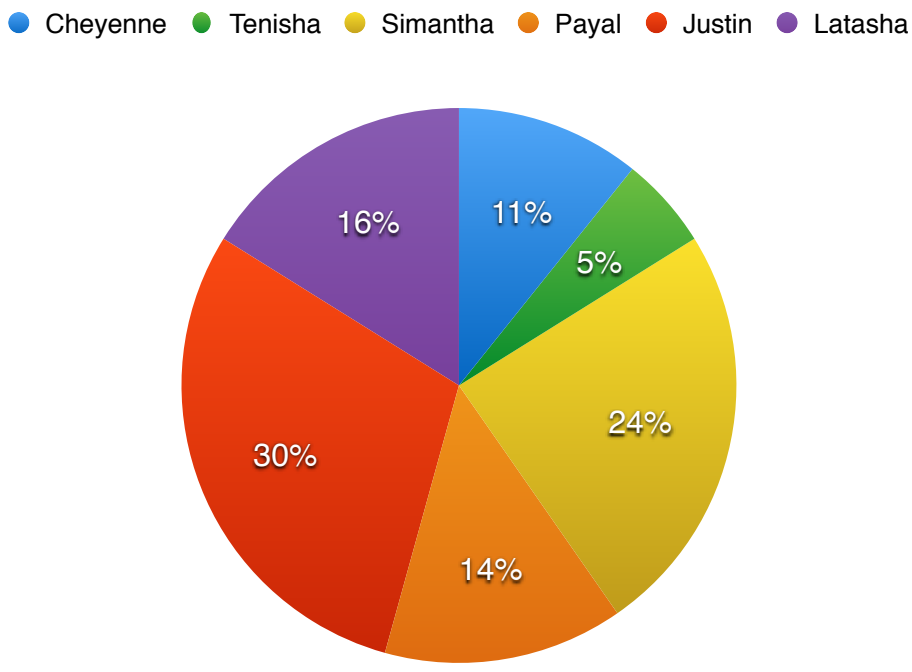
8. Were there any bugs?
    1. getting stuck to the wall and then not moving again
    2. getting pushed into the dead zone

Figure 7 showing a pie chart of the play testing results and of the common results concerning play testing from both internal and external play testers of how fun the game was



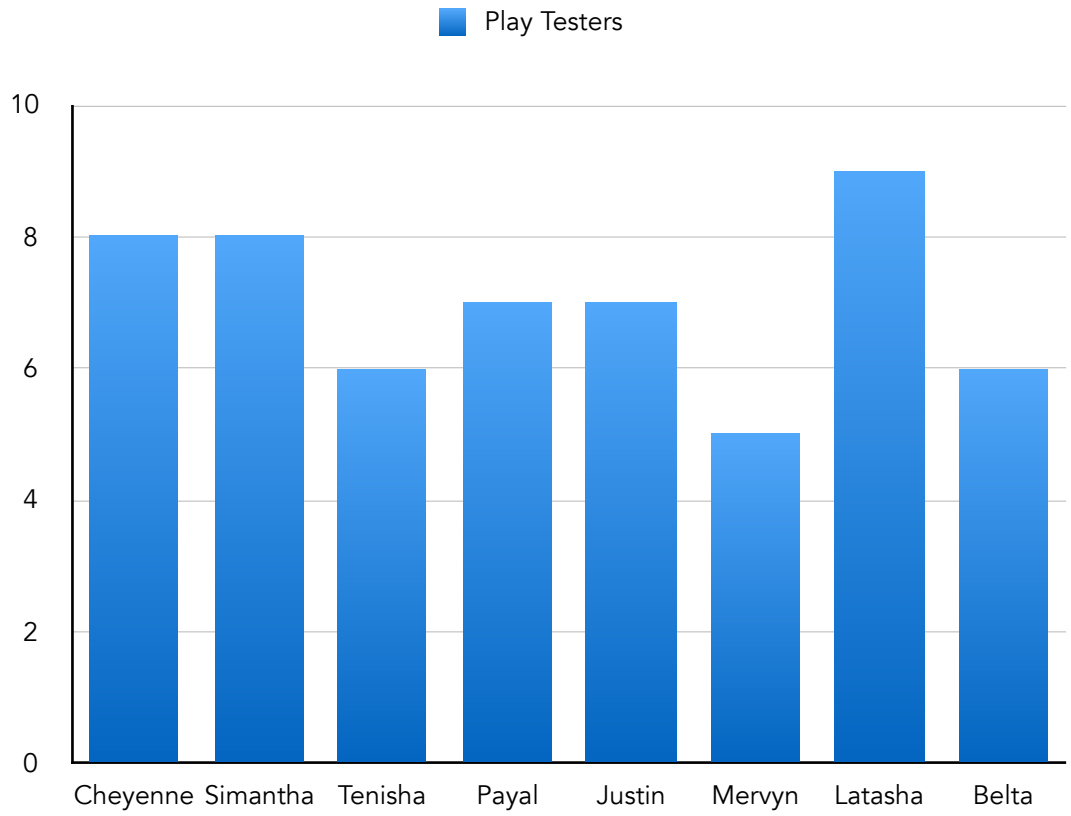
Therefore the consensus was that the game was fun, although it was also frustrating in the more difficult levels. The frustration lead to the feeling of elatedness however, when the player eventually got it right.

Figure 8 showing a pie chart of the play testing results and of the common results concerning play testing from both internal and external play testers of how players felt about the trajectory line



The consensus here is that the trajectory line was not necessary. Some of the play testers would have loved to have one but a similar number of play testers really enjoyed the game without it because it allowed the player to perceive direction and trajectory by themselves without having to be told where to go.

Figure 9 showing a pie chart of the play testing results and of the common results concerning play testing from both internal and external play testers of how they would rate the game out of 10



The consensus here is that out of 10, the game would average out to about a 7 out of 10. The question is vague so the rating can range from enjoyment, to the literal game theme of genre itself so the rating has no real change to the game itself but it does show me how play testers would feel regarding my game in general.

Figure 10 Screenshot showing Scene 1 of my game, where the player is first introduced in a sort of tutorial phase to drag and shoot the ball in order to start the game

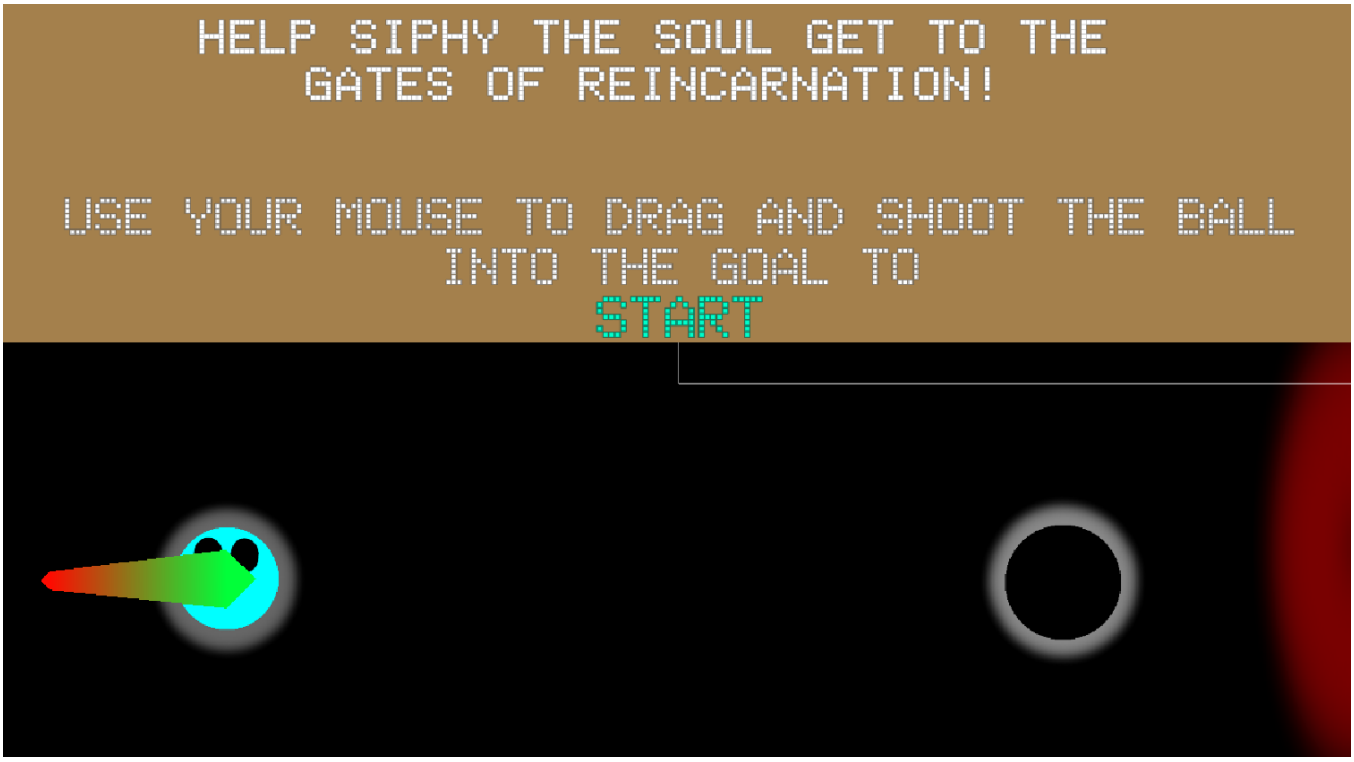


Figure 11 Screenshot showing Level 1, where the player is now introduced to the ability ball and how the player must use the ability ball to push the objective ball into the goal

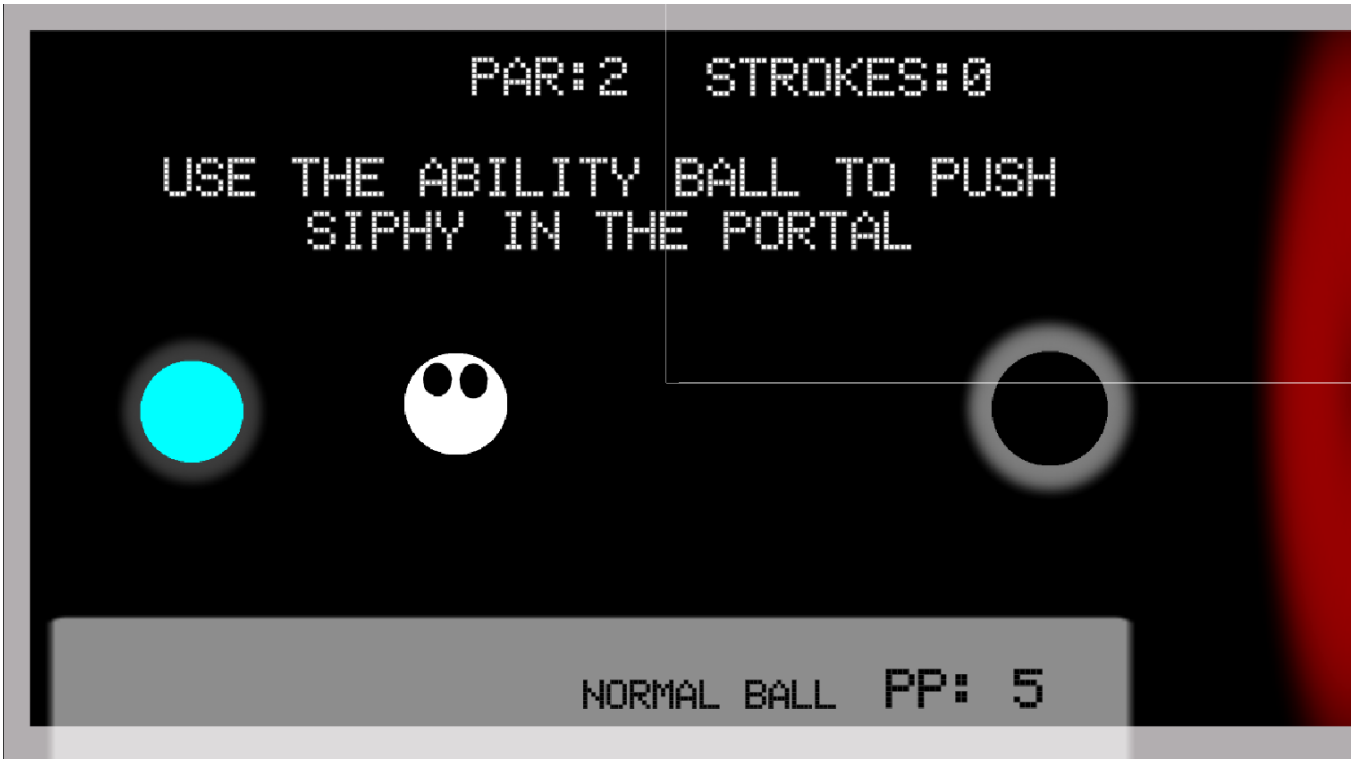


Figure 12 Screenshot showing Level 2, where the player is now introduced to the fact that there can be multiple different ability balls and how the can move between ability balls. Also introduced to the Phase Ability along with a Phase wall

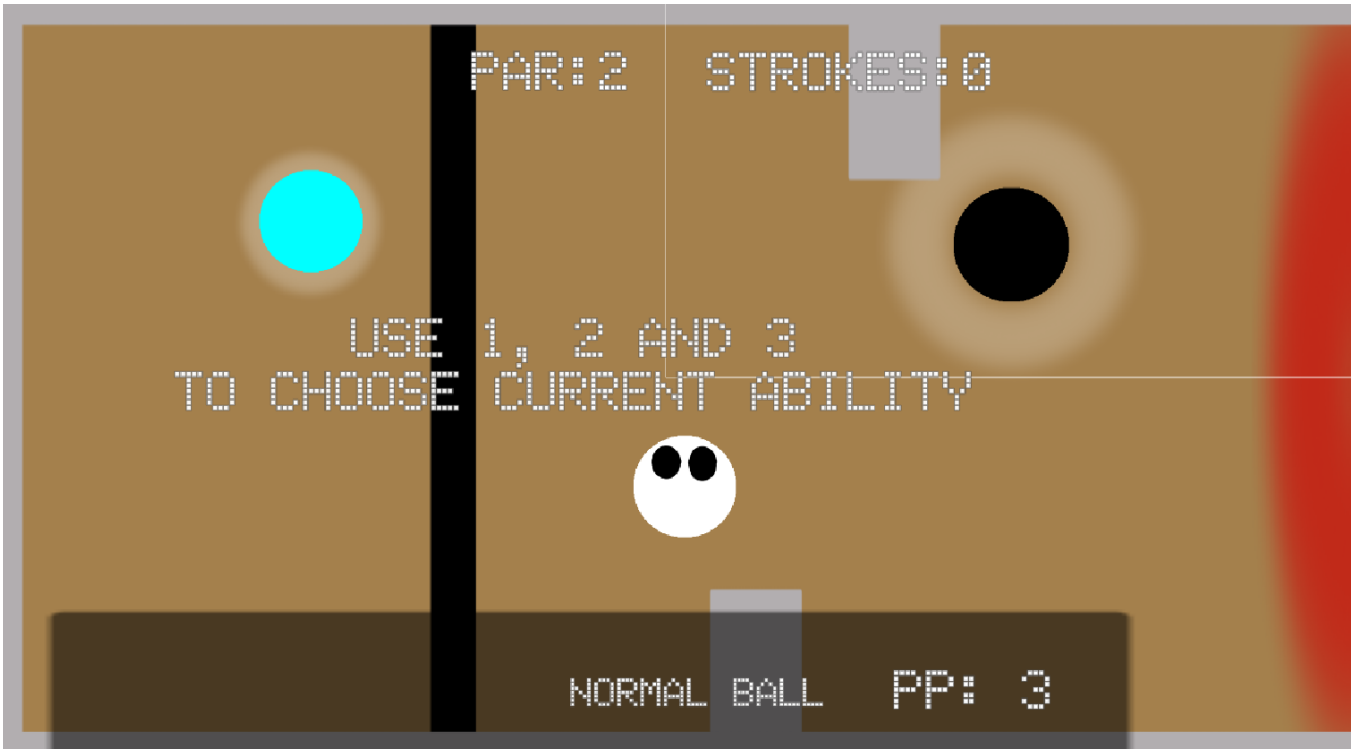


Figure 13 Screenshot showing Level 3, where the player is introduced to the wall switch walls and a slightly more complex level which also has a phase wall

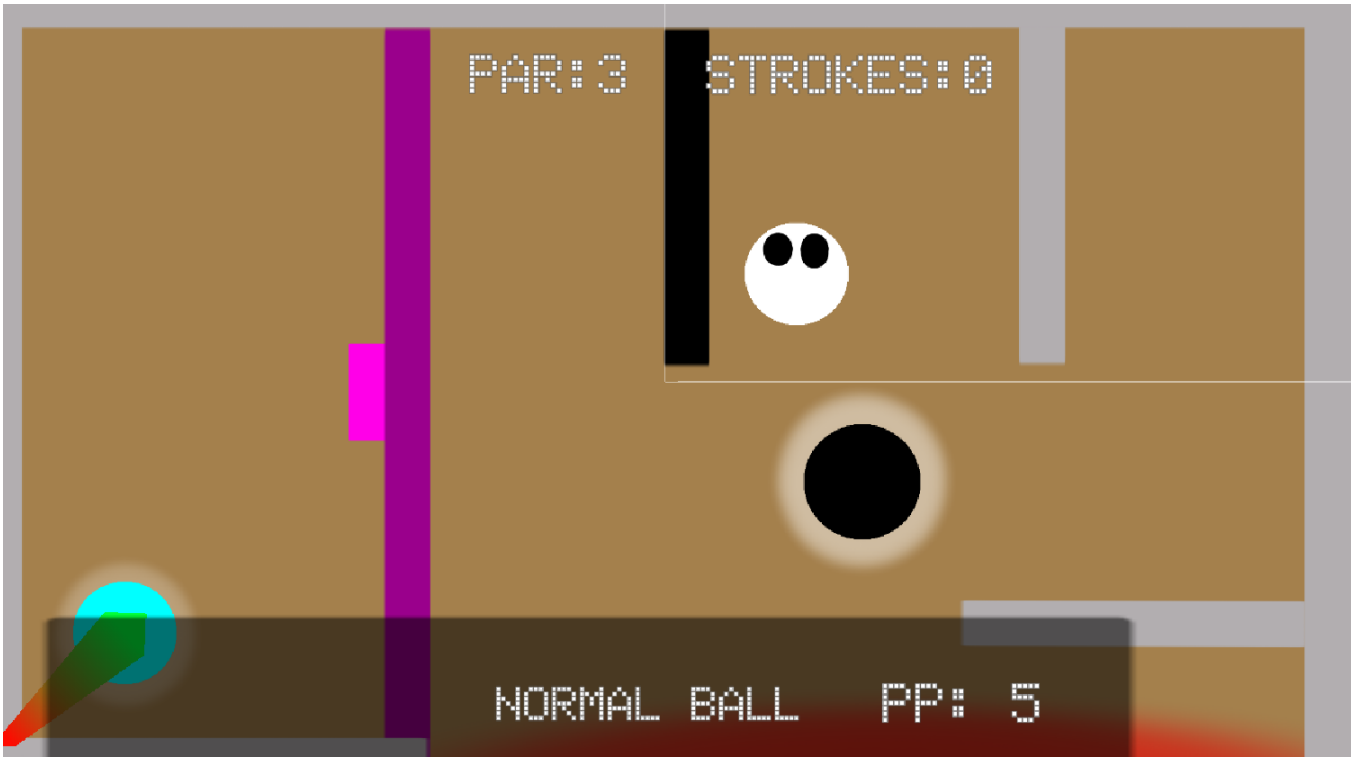


Figure 14 Screenshot showing Level 4, where the player is introduced to the final level which is the hardest level and is also the level where the sticky ball is introduced along with a sticky wall.

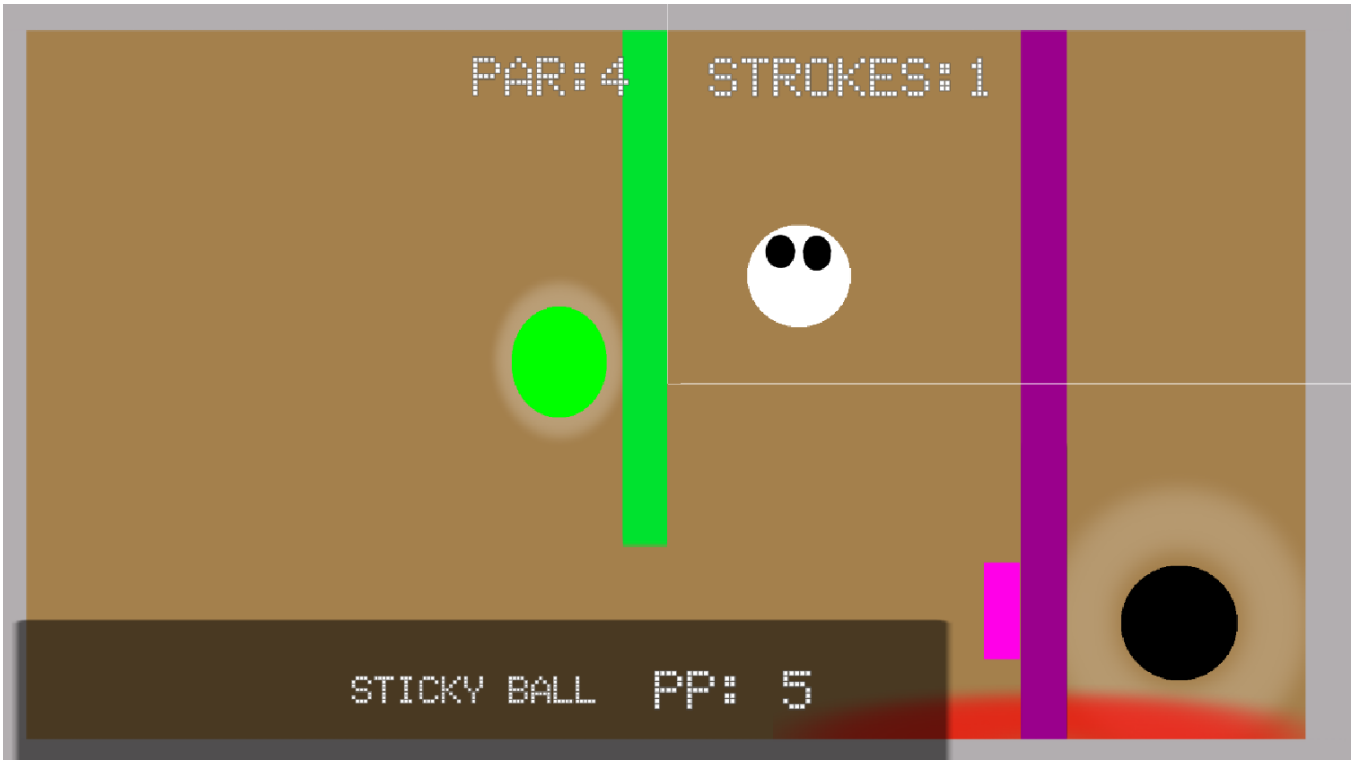


Figure 15 Screenshot showing the start page that appears before the player proceeds with the first level.

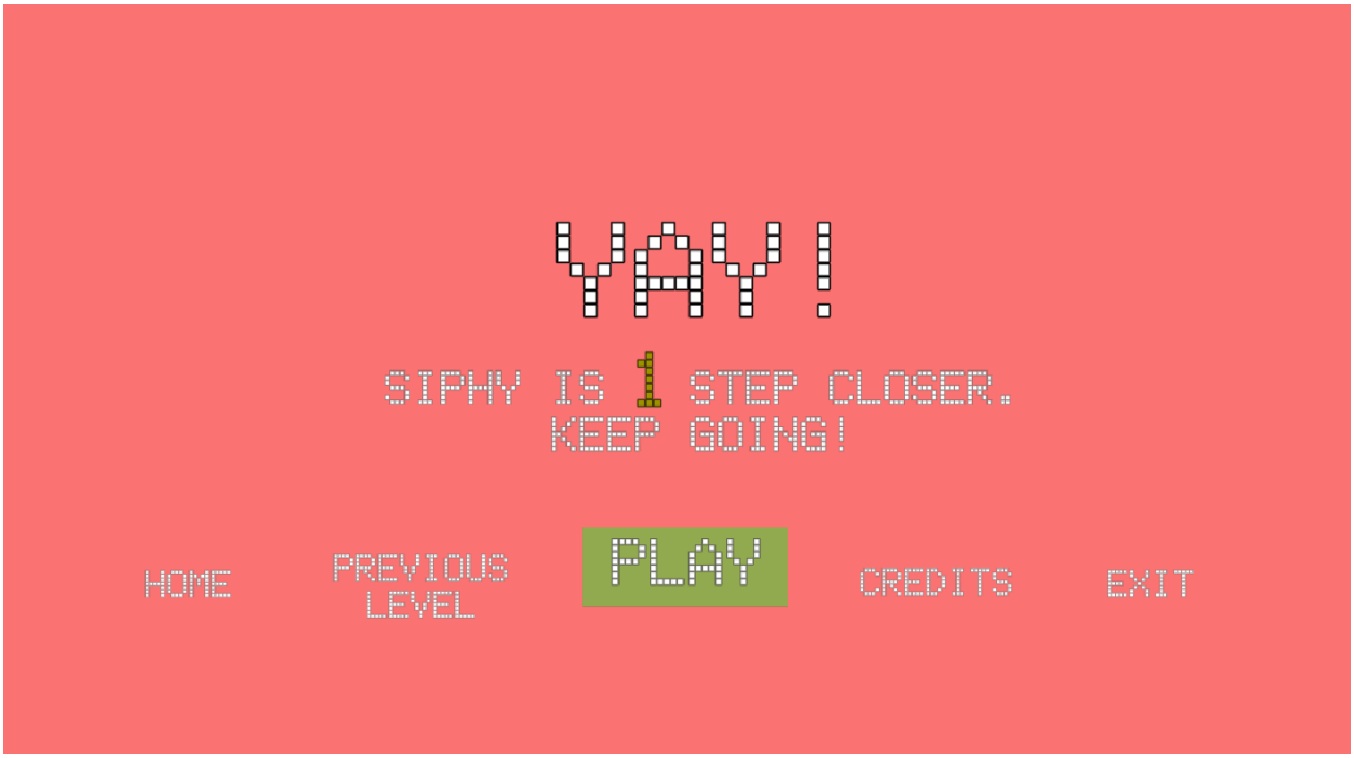


Figure 16 Screenshot showing the warning of the Drag and Shoot mechanic

Figure 17 The updated Project Plan

Group 9
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Tenisha Moodley - 2105982

1. Game Pitch

Imagine playing a game similar to billiards but on an Adventure golf course. This is the core mechanic of this game concept. This game takes the player through puzzle-packed courses which take inspiration from a mini golf game, using a similar level of agency that one would have in a game of billiards. The game fancies the use of these game elements in order to make silly yet strategically designed game courses, encouraging players to test and explore the numerous interesting ways in which they can sink the objective ball into the pocket at the end point of each stage.

2. Product Introduction/Overview

Project Outcomes and Requirements

This project requires a single-player, physics based, digital game concept that utilises the Iterative design process in order to design the game according to the constant changes the game implements throughout development. The outcome of such a process should result in a complex-dependent game that focuses its depth through Data design, Feedback design, Level design and Feedback loops rather than through numerous complicated game elements.

Project Management Methodology

Project plans are used to help developers communicate with all of the members involved with the project and further help developers perceive project risks, budgets and dependencies in order to reduce risks, manage the work, and guide themselves from the beginning to the end of the project. The project management will therefore follow a value system concerning game elements and tasks, in order to prevent discrepancies within the design of the project.

Start and End Dates

24th May - 18th June which allocates less than 4 weeks to complete the game and the reflection of the iterative game process.

3. Process

The development process of the game will start by developing a working prototype which allows the player to operate the basic hitting mechanics which the game intends to be built upon. This should allow for basic playtesting of the primary game mechanic. Once the player is able to move and apply force to the game pieces in a way that can allow the game to function in its most basic form, work on the ability mechanics can begin. The development of said ability mechanics should be accompanied by the implementation of the environmental game objects as they are intended to function in a symbiotic manner with one another. The obstacles which the ability mechanics are used by the player to overcome, should each be tested individually. For instance, the placing of walls within any of the levels should be tested in how it provides the player the opportunity to use the given ability mechanics like the ability to break walls or move through them. This is intended to forge meaningful application of the game's secondary mechanics. Once all the planned mechanics have been implemented in a working prototype which allows for full playtesting of the level designs, external playtesting may begin to a further extent in order to collect data regarding the game in its initial prototype phase. This data will be taken into account when finalizing the tuning of mechanics as well as improving any issues which come to attention from the playtesting process.

Playtesting will also help gauge the level of communication brought across by the game and should help improve anything that requires more clarity.

Once the gameplay is at a satisfactory stage, polishing of the final product can begin. This will include the implementation of user interface elements for menu navigation as well as general touching up of the visuals.

Documentation regarding how the process will be carried out on a week to week basis can be seen on the scheduling found on the appendix.

4. Milestones

Working Initial Prototype

- Program the ball controller to allow the player to apply a force to hit the balls with the desired amount of power and direction. A line renderer should denote both power and direction.
- Create prefabs for the various game objects that will act as obstacles and implement them in a basic level format to be playtested.
- Implement initial ideas for the basis of each level design individually.
- Program ability ball mechanics to behave as intended.
- Program the success state to occur when the player reaches the goal region with the objective ball.
- Program a fail state to occur when the player does not complete a stage within the given limitations.
- Implement basic forms of communication for implemented mechanics.

Iterating on Initial Prototype Finalise the level designs.

- Finalise the tuning of the variable constants which influence the behavioural physics of both the ball hitting mechanics as well as the environmental aspects.
- Finalise ability mechanics to work smoothly within their respective level environment.

- Use play-testing data to finalise any issues found with initial prototype mechanics and level designs and improve communication for anything that is found to be unclear.
- Polishing the Final Product
- Implement further user interface elements which communicate the limitations of the given level. This will also include UI which allow the player to operate mechanics within the game like switching between the ability mechanics.
- Implement the menu user interface elements which allow the player to quit the game, enter a specific level, or potentially view a tutorial screen (tutorial may be included within the initial levels).
- Apply finishing details including custom fonts, materials, textures.

5. Task Breakdown

The task breakdown table below describes the logical order of milestone completion and the set of tasks needed to achieve each milestone. The order of tasks is done in the order of dependencies. The tasks further down the timeline are dependent on the previous tasks. Each task is also given a category of either ‘need’, ‘want’, or ‘dream’. These categories denote the importance of each task completion to achieve each milestone. The first set of milestones are aimed at achieving a practical, working prototype, that will allow for effective early on playtesting.

Table showing the task breakdown of each milestone and each tasks implementation necessity status

Milestone	Need/Want/ Dream	Task
Program the ball controller to allow the player to apply a force to hit the balls with the desired amount of power and direction. A line renderer should denote both power and direction.	Need	Create ball objects and add physical properties.
	Need	Create a controller that allows interaction with the balls.
	Need	Add a visual trajectory line of balls.
Create prefabs for the various game objects that will act as obstacles and implement them in a basic level format to be playtested.	Need	Create each game object. This includes the level floor, obstacles(scenes) and other interactables.
	Want	Create extra level objects.
Implement initial ideas for basic level designs.	Need	Use level prefabs to create a basic level for testing.
	Want	Create more complex levels.
Program ability ball mechanics to behave as intended	Need	Create the ability ball and add it's physics controller.

	Need	Create various ball abilities.
	Need	Implement a UI which allows the player to switch between the current ability assigned to the ability ball.
	Want	Create extra ball abilities.
	Want	Add detailed visual communication to Game objects
	Dream	Add animations and sounds to Game objects
Program the success state to occur when the player reaches the goal region with the objective ball	Need	Create a visual UI element that shows the player has failed.
	Need	Allow the player to move to the next level.
	Want	Allow the player to repeat the level.
Program a fail state to occur when the player does not complete a stage within the given limitations.	Need	Create a visual UI element that shows the player has failed.
	Need	Add reset/repeat UI level button.
	Dream	Add animation to the UI element.
Implement basic forms of communication for implemented mechanics.	Need	Add visual communication and feedback to objective ball and ability ball
	Need	Add visual distinction between each level object
	Want	Add sound to game objects.
	Dream	Add animations to gameobjects.
Finalize the level designs	Need	Create a set of levels that are diverse using a multitude of game objects
	Need	Create tutorial, or beginning levels that introduce the player and guide them through the beginning of play.
	Dream	Have a minimum of 10 levels

Finalize the tuning of the variable constants which influence the behavioural physics of both the ball hitting mechanics as well as the environmental aspects.	Need	Use data design integrated into game objects to change their behavior according to playtesting feedback.
	Need	Use playtesting data to update communication design on level elements.
Finalize ability mechanics to work smoothly within their respective level environment	Need	Use playtesting data to update ability mechanics.
Use playtesting data to finalize any issues found with initial prototype mechanics and level designs and improve communication for anything that is found to be unclear.	Need	Make changes to communication design, level design, game objects and mechanics as needed.
Implement further user interface elements which communicate the limitations of the given level. This will also include UI which allows the player to operate mechanics within the game like switching between the ability mechanics.	Need	Such as if ball ability has been used, then that colour ball should no longer be available to the player in that level.
Implement the menu user interface elements which allow the player to quit the game, enter a specific level, or potentially view a tutorial screen (tutorial may be included within the initial levels).	Need	Create an in-game menu screen.
	Want	Create a start menu.
Apply finishing details including custom fonts, materials, textures.	Need	Use play testing data to make any changes to game objects, level design, communication design, and mechanics
	Want	Add animations to UI and other game objects

6. Feature List

- A Top-down physics-based puzzle game developed for the PC format.
- The game will include 4 levels and a tutorial
- A main menu, pause menu, settings menu, failure menue, win menu, credits menu and quit application function however a tutorial page may be optional.
- Uses both mouse and keyboard support.
- The player can hit the ability ball and use it's mechanics to traverse the course.
- An aim indicator allowing players to see the direction of where they are about to hit the ball.
- A minimum of 2 ability ball mechanics which the player may choose to use.
- Ball physics that allow the ball to act as the developer would want.
- A set of environmental game objects including things like walls, switches, and moving surfaces.
- A backend system which tracks the player's efficiency in the completion of levels. Which is also now designed to give the player feedback on their strokes counts for each level and whether they stayed within par or not.

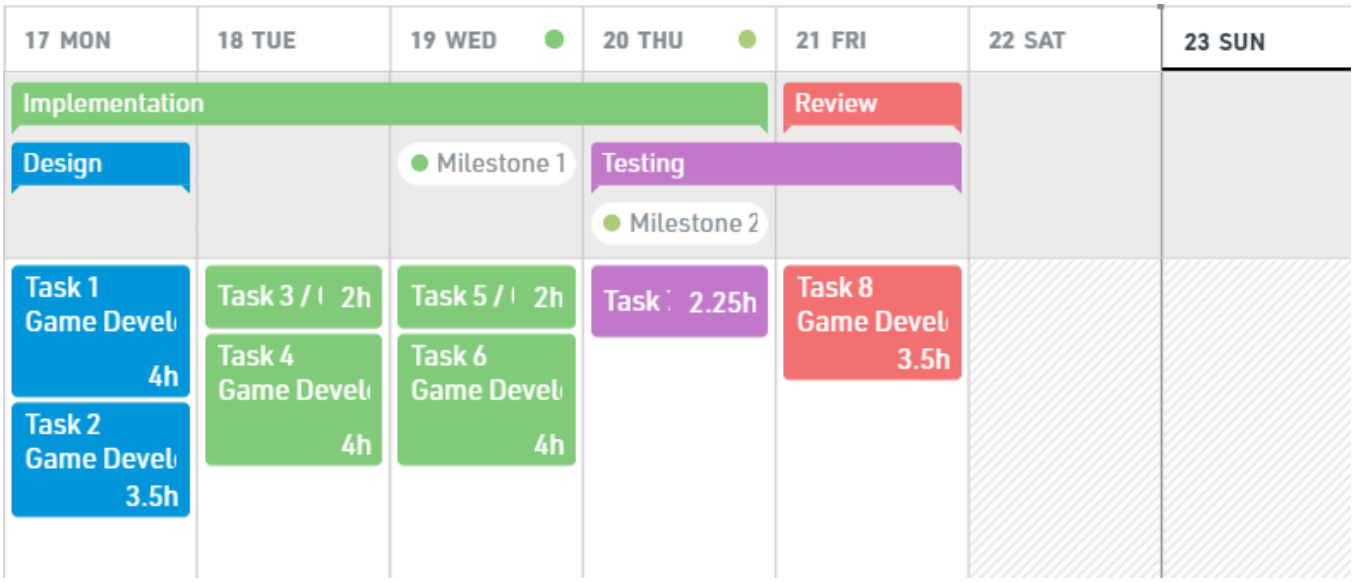
7. Scheduling

The schedule[1] will follow a weekly cycle that is geared towards milestone achievement, testing, and iteration. Figure 1 below describes a generic week of the schedule. Each week has a 'design', 'implementation', 'review', and 'testing' phase. The schedule is designed to encourage iteration and re-design, based on information gained from play testing.

Figure 1: A generic weeks' structure with example phases, milestones and tasks

A testing period will be established after each milestone has been implemented, this testing period will be used to encourage iteration and redesign, allowing the designer to 'follow the fun'. There is no activity scheduled for Saturday and Sunday, this time will be reserved for overcoming any delay due to any uncontrollable variables, these are detailed in section '8. Risks'.

The full schedule can be seen in the appendix, subsection A.



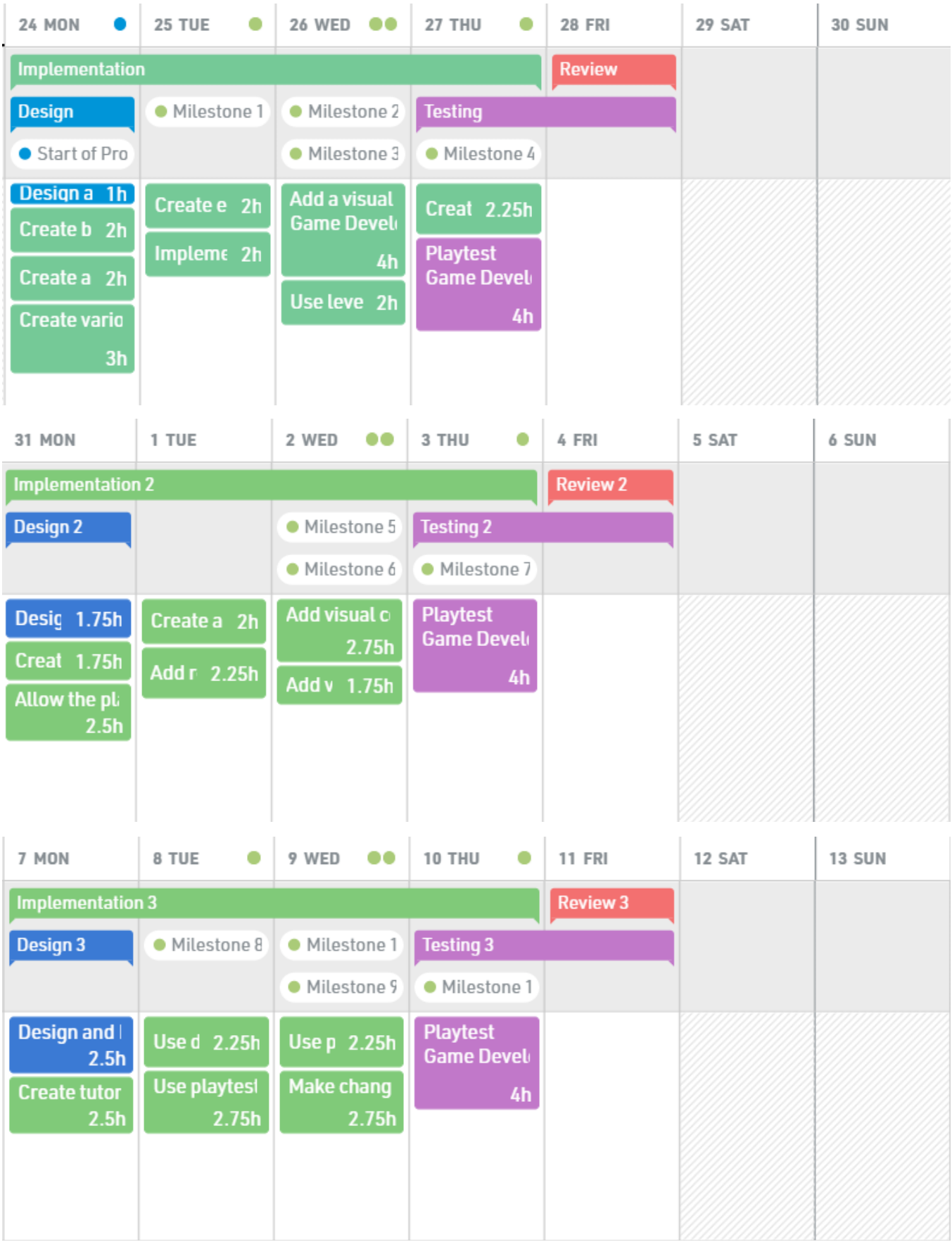
8. Risks

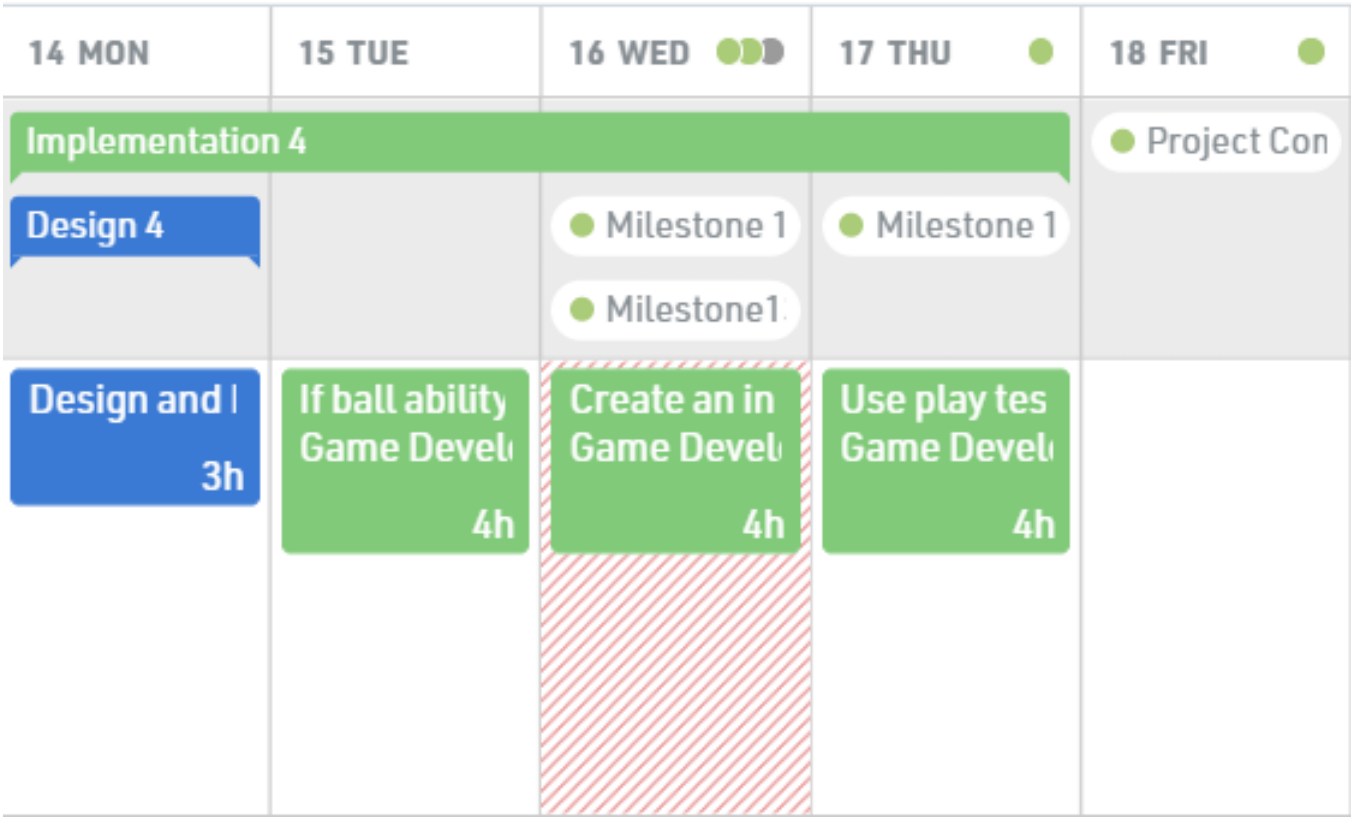
A Table showing the Risks that could take place during the development of this project.

Risks	Primary Level	Secondary Level	Tertiary Level	Why
Load Shedding	X			Primary level risk because load shedding is a high possibility in South Africa
Illness		X		The risk of illness could have various effects on productivity depending on the severity of the illness. It could potentially be serious because of COVID-19 or other serious illnesses, however it could not be serious and therefore not that big of a risk
Internet Failure (Unrelated to electricity failure)			X	Tertiary level risk because it is unlikely to happen, but still has a possibility with electricity failures affecting the working ability of the internet

9. Appendix

A Full schedule for the duration of the project.





10. References

[1] Float.com. (2021). *Float - Resource Planning & Management Software*. [online] Available at: https://www.float.com/ [Accessed 23 May 2021].

Figure 18 The updated Game Design Document

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1. Overview

This project details a game concept which is a physics based puzzle game. The game requires the player to knock the first ball into a pocket by using a second ball. The game will set out similarly to a game of billiards as the player must use a second ball to collide with the first ball in order to knock the first ball into the pocket. For the sake of this document, the first ball which must make its way to the pocket will be referred to as the target ball, and the second ball which must be used to knock it in will be referred to as the ability ball. The target ball may only be hit one time by the player, at sometime in the level. The ability ball may be hit multiple times but within a limited number of attempts relative to the level the player is in the process of completing. The ability ball will have a set of abilities which the player must use to overcome the set of obstacles laid out before them in the level. Each level is a unique course with a different set of obstacles that form a puzzle which the player must solve using the ability ball's mechanics. The level will conclude once the player has successfully set up the ability ball and used it to knock in the target ball.

2. System of Mechanics

The primary gameplay loop will entail the player operating a controller which hits the objective and ability ball with an impulsive force. The player will control. The player will use this controller to initially position the target ball with a single hit. After the first hit, the player must hit the second ability ball to knock the target ball into the pocket within a limited number of attempts which would be specific to the implementation of each individual level.

In the current version of the concept the player views the entirety of the course from a top down camera perspective, but this may vary with the implementation of different levels of verticality.

Varying ability ball mechanics are intended to be implemented to work together with different physical forces and environmental objects in order to create obstacles which the player must

overcome. These ability mechanics will include things like being able to travel through specific walls or being able to control certain collisions. Other mechanics may be implemented to work within the environment of different levels such as the ability of the sticky ball sticky to sticky walls or the phase ball moving through phase walls.

Ability ball Mechanics:

- The Sticky Ball sticks only to sticky walls
- Normal Ball is a ball that has normal physics of a hard solid spherical object
- The Phase Ball can go through phase walls
- Figure 11 and figure 12 in the appendix show concept and technical art for the phase ability ball. The figures indicate design, aim indicator, and collision interaction.

3. Communication Design

Varying platforms which have different physical properties are obvious to the player in how they behave. They have differing sprites, colours and systematically their dynamics change such as that with the phase ball the ball is the same colour as the phase wall which indicates that it can only go through the phase wall **(see figure 15)**.

The different abilities which the ability ball employs should be communicated to the player in as many different ways as possible. These mechanics should be indicated through colour coordination as well as other potential visual cues which may indicate the outcome where possible such as the name of the ball being displayed to the player as done in **figure 14**. Since the player will be limited to how many times they may use the ability and target balls, the visual counter displayed to the player is needed as well. The feedback design should be explicit enough to ensure that the player is able to easily remember the response they get from applying any of the implemented ability mechanics after using each one.

Figure 12 and figure 13 in the appendix show concept art for the in-game UI overlay. And figure 14 shows what UI overlay looks like now.

4. Data Design

The data design should aim to balance the game and give the developers control of the variables regarding the physical properties of the hit mechanics as well as the environmental objects. This should allow the tuning of the physical responses which the player will experience when exercising the system of mechanics. The tuning of said variables will be done iteratively through a series of playtesting in order to achieve an ideal game feel.

Types of data to have control over:

- Max power of ball hit.
- Friction value of ground and ball
- How many shots is the player allowed per level
- Bounciness of walls and ball
- Size of target pocket
- Size of balls
- Weight and feel of the balls
- What properties the ability balls have

The game system will keep a record of how many times the player has hit the ability ball during each individual stage. This data can be used to indicate to the player how efficiently they were able to complete the stage. Each stage may also place limits on this data in order to create different levels of challenge.

5. Level Design

The ability mechanics which the ability ball employs should be specifically designed to work within the environments provided by the various stages. For instance, if the player is presented with the ability to travel through walls, they should be presented with the opportunity to do so in the given level. Some levels may put focus on individual ability mechanics in order to familiarise the player with how said mechanics function early on in the experience. Stages which attempt a higher level of difficulty should employ a combination of the different ability mechanics with an increasing number of moves required to solve the puzzle. Levels may differ in design but should all come back to the goal of having the player knock the first ball into a goal region with the second ball.

The order in which the player progresses through the various stages should be situated in such a way so that the game uses early levels to show the player how the basic mechanics work. Later stages would then use the principles which the player learnt earlier on to create more complex puzzles. The intention would be to create a difficulty curve which sees a gradual increase in complexity in puzzles.

Each level has a set of micro goals, the design of each level should fulfil these goals in order to ensure the macro level structure of the game is a well curated experience, that offers the player a fun experience with a good game flow and difficulty level. The first levels should be an introduction to the core system and gameplay loop, and offer a space for the player to explore and get a feel for the shooting mechanic and power levels. The use of many game

objects will help increase the level of conceptual and complex difficulty. The concept sketches in the appendix theoretically achieve similar micro goals to each other.

Concept art regarding different elements of level design found in the Appendix showing concepts such as the Dead Zone and establishing the game pieces **(Figures 1 - 3)**, ball abilities and emphasis on the movement of walls and balls **(Figures 7 - 10)**, and interesting level designs incorporating puzzle elements and wall switches **(Figures 4 - 6)**.

Environment Objects:

- Static wall
- Moving wall
- Wall switches which open doors within the level
- Deadzone

6. Game Design Intent

The intent of the primary gameplay loop is to provide the player with a puzzle which they must solve by using the system of mechanics presented to them in order to complete each stage. Since the game is physics based, solving each puzzle will not only require the player to figure out the sequence of actions they must perform but also time their shots correctly and estimate the power and direction necessary to achieve the desired outcome. Different mechanics and level designs intend to create a system where the player must use their understanding of the environment and their own capabilities to solve the level put before them. The top down perspective is intended to give the player a full view of the level which would allow them to plan out the sequence of moves required to solve the puzzle.

7. Appendix

Level Concept Variations
Designs and descriptions by Tenisha Moodley

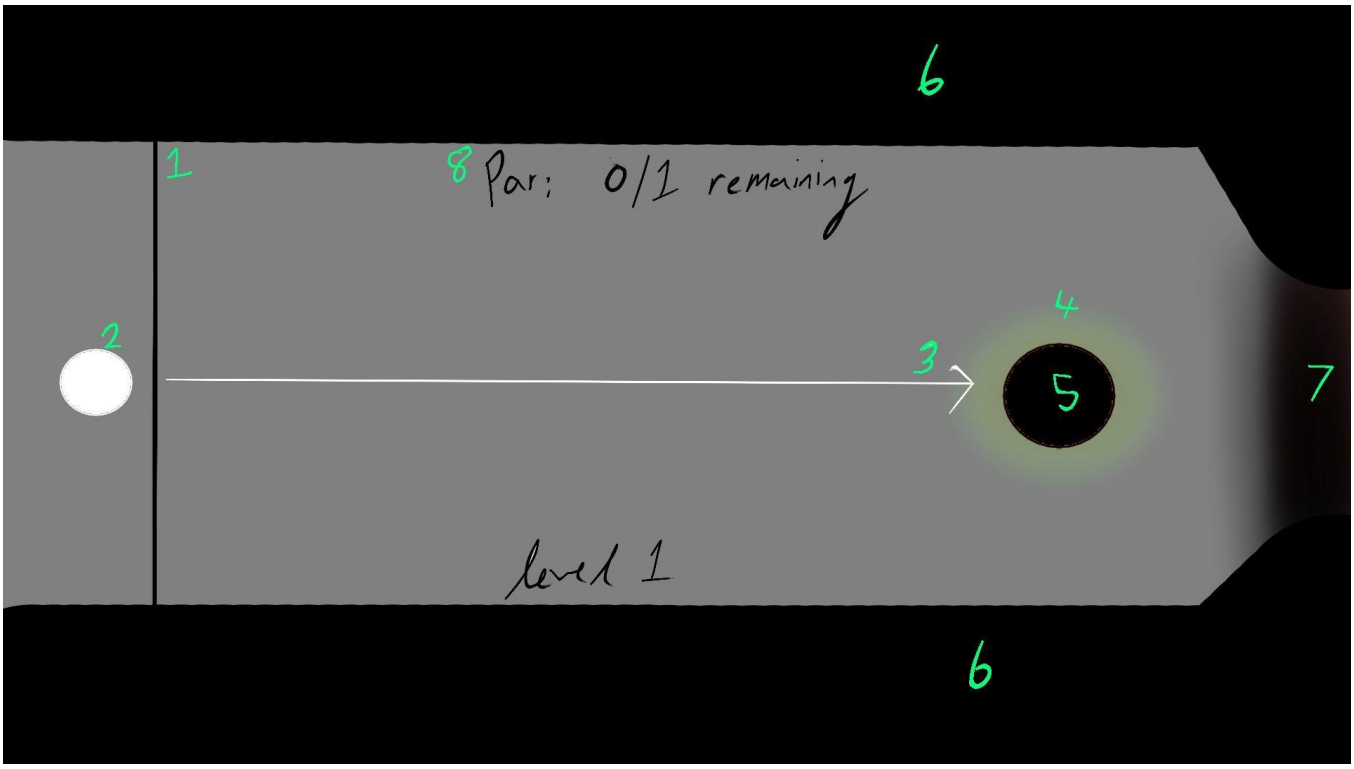


Figure 1 Image showing Concept Design for Level 1

1: The Startup line where the objective (white) ball and the ability ball start from on their first hit. In this level, the right side of the startup line is a solid wall that the balls cannot pass through.
2: The White Ball, like in Billiards and PuttPutt games, this ball is the 'main ball'. In this game, the white ball is the reverse of the white ball in a Billiards game, and therefore has the similar abilities to that of the ball in PuttPutt. The player has to sink the white ball into the hole at number 5.

3: The Action line representing the white ball's trajectory from how the player hit it.
4: The Pull Zone. This zone surrounds the sink hole and acts like an atmosphere to the hole, providing a weak gravitational pull towards the hole. It's not very strong, so the ball can bypass it if hit too hard. 5: The Goal Zone where the player is aiming to get the white ball.
6: The Walls. These walls are just solid walls that the ball bounces off, and provides constraints for the level.
7: The Dead Zone. A place where the ability balls can't go, but the white ball can. If the white ball enters this area then the level is lost automatically.
8: The Par score: This is the number of hits the player is allowed before they've failed the

game. A hit refers to the successful drag and shoot motion of any of the balls found in that level. (Does this count the beginning two shots from the startup line?)

Intended player experience: This level is designed to introduce the main game pieces and mechanics to the player. It should be simple, quick and easy but still be descriptive enough to the player.

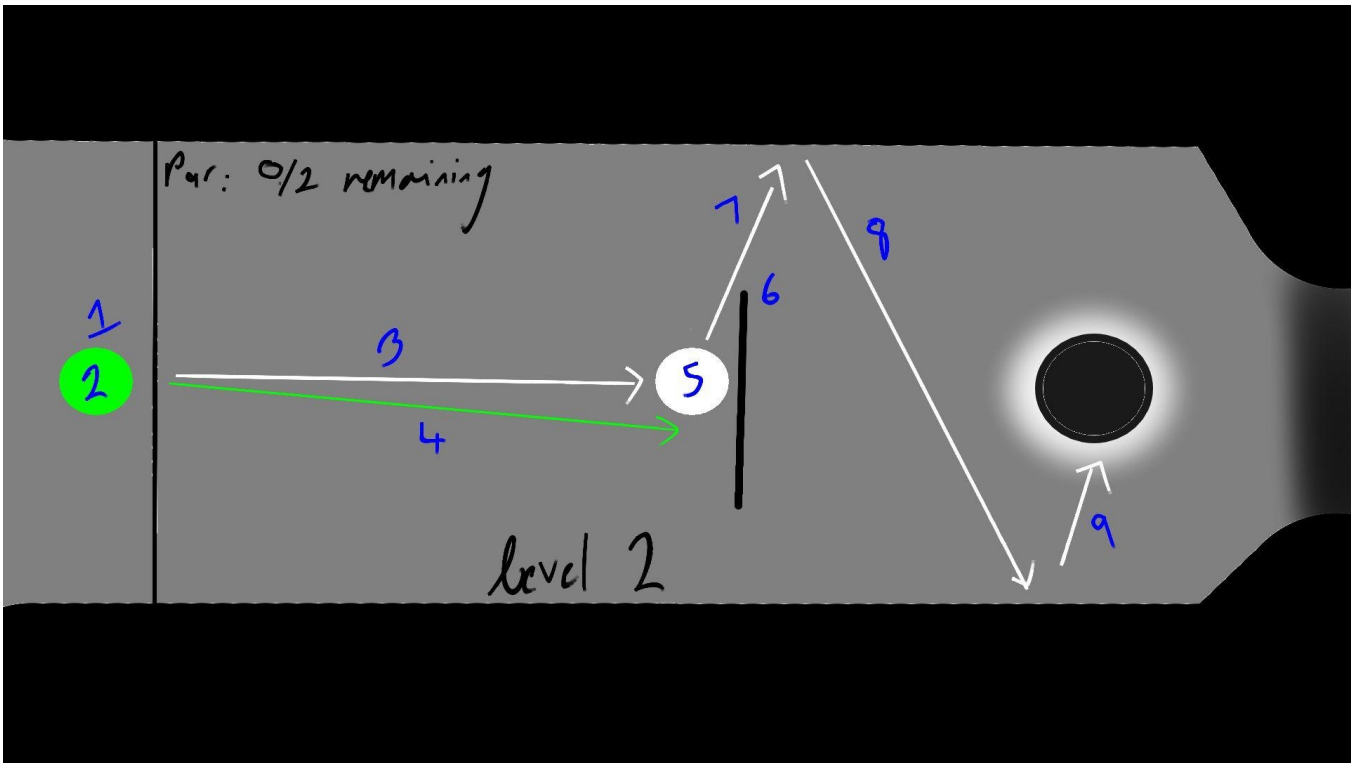


Figure 2 Image showing Concept Design for Level 2

1: The Objective Ball (white ball) and Ability Ball (different coloured ball) Startup Position. The Objective ball appears and the player is required to pull and shoot it. After it has been shot, the Ability ball appears in the same position but being whatever colour it is.
2: The Ability Ball. This Ball only has the ability of being a normal ball.
3: The Action line representing the trajectory of the Objective ball took on its first shot.
4: The Action line showing the ability balls trajectory line. The Ability ball only has one shot, so it would either disappear or become uninteractive after this shot.
5: The Objective ball once stopped moving after colliding with the solid wall at number 6.
6: The solid wall obstacle.
7,8 and 9: The Action lines representing the bounces that the Objective ball could possibly look like after being hit by the Ability ball at that angle, which don't count in the par.

Intended player experience: Another short and quick level that introduces the appearance of Ability balls, and obstacles. The player can use the Objective ball to get to the goal by just

using the Objective ball if they are willing to get the par in 1 shot rather than two and therefore gain more points.

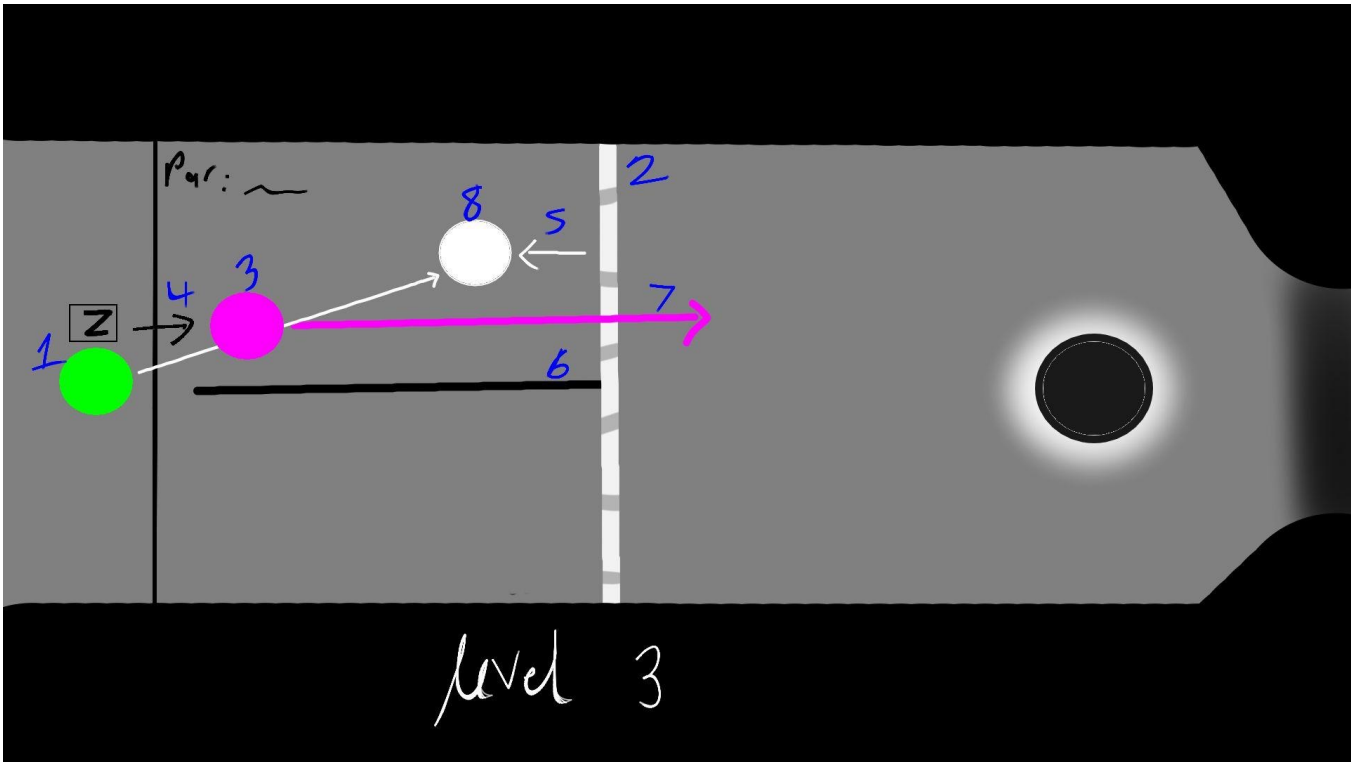


Figure 3 Image showing Concept Design for Level 3

1: Ability Ball 1 - The Normal Ability Ball
2: The Breakable Wall - Can only be broken by the Wall Breaking Ability Ball
3: The Wall Breaking ability ball, all ability ball mechanics can only be used once
4: The Action of pressing the Z Key in order to switch between Ability ball's abilities, since there is one Ability ball which has numerous abilities but only one ability can be used at a time.
5: The action line showing the Objective ball bouncing off the breakable wall
6: The solid wall is placed here to encourage the player to not only shoot forward
7: The action line showing the wall breaking ability ball being used to smash through the wall
8: The Objective ball

Intended player experience: This level introduces the multiple ability ball mechanics mechanic by not only allowing the player to now interact with the Ability ball more than just dragging and shooting it, but also by using a key to switch between the Ability ball mechanics. It also emphasizes the introduction of more Ability ball mechanics, by introducing a complimentary game obstacle which can only be bypassed by using the newly introduced Ability ball mechanic. Furthermore, it also introduces the increase of level difficulty through each level.

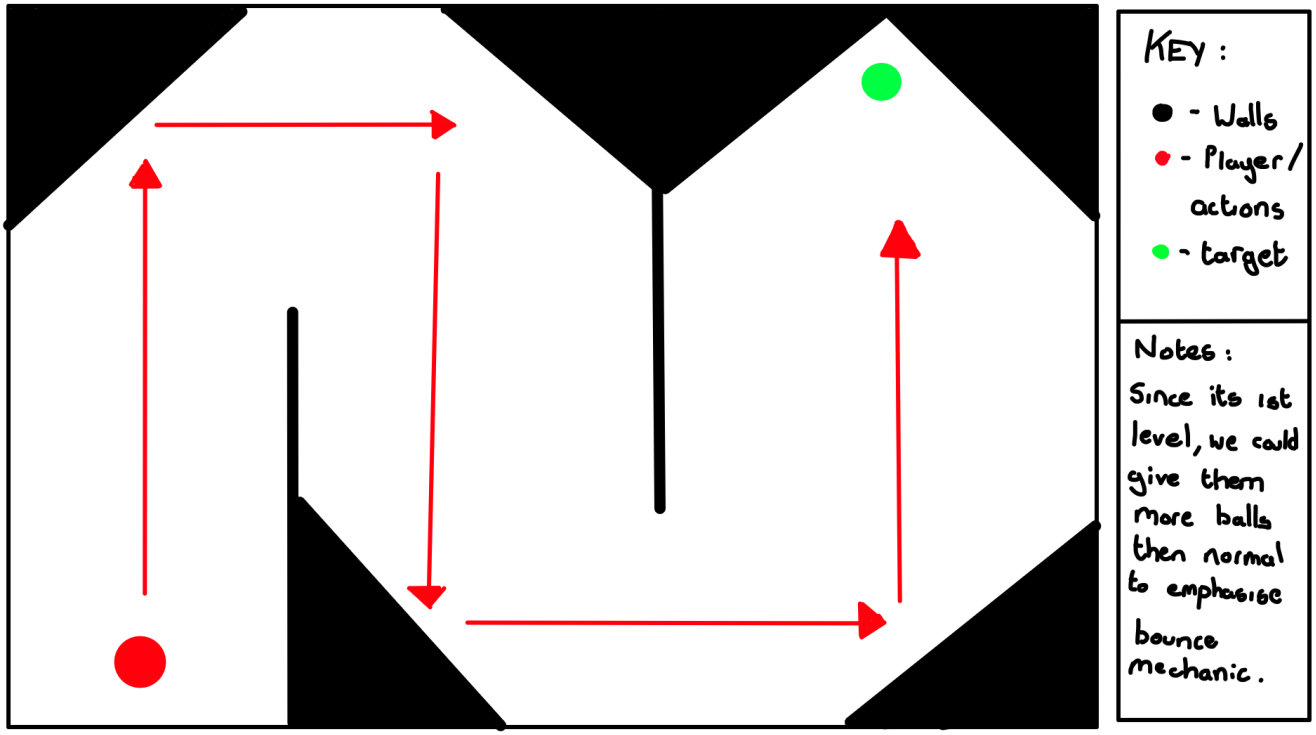


Figure 4 showing level design concepts for Level 1.
For the first level concept, the intent is for the player to identify the main ball mechanic as well as create an emphasis on the ball bouncing off walls, richoteting towards the target. The limit of ball

bounces are increased to allow the player a limited amount of freedom to learn the mechanics of the game.

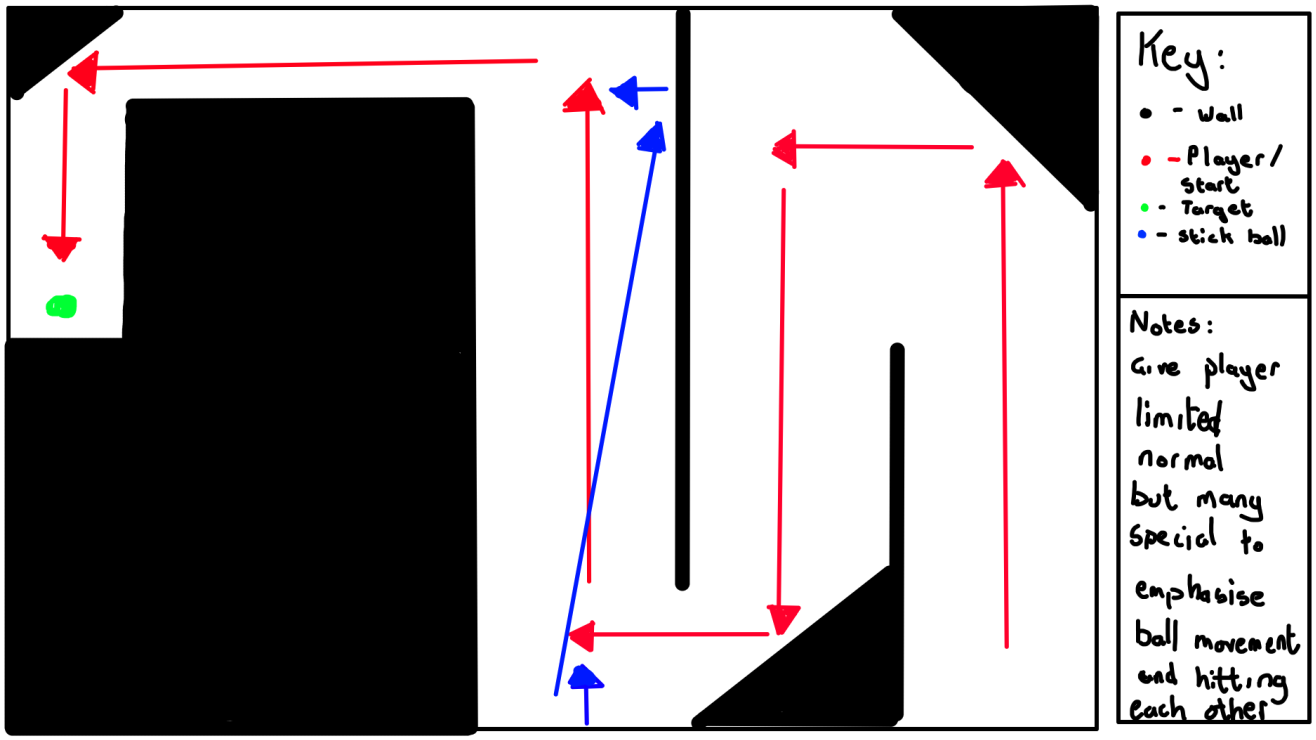


Figure 5 showing level design concepts for Level 2.

For the second level concept, there is also a new ability ball introduced, with the level designed to

incorporate the new ball's abilities. There is still an emphasis on the ball bouncing off walls, however there is now a limit of how many bounces are allowed per ball type. This presents an increased

difficulty as well as allows players to strategically plan how to play the level, forcing players to use both ball variants to achieve the level objective.

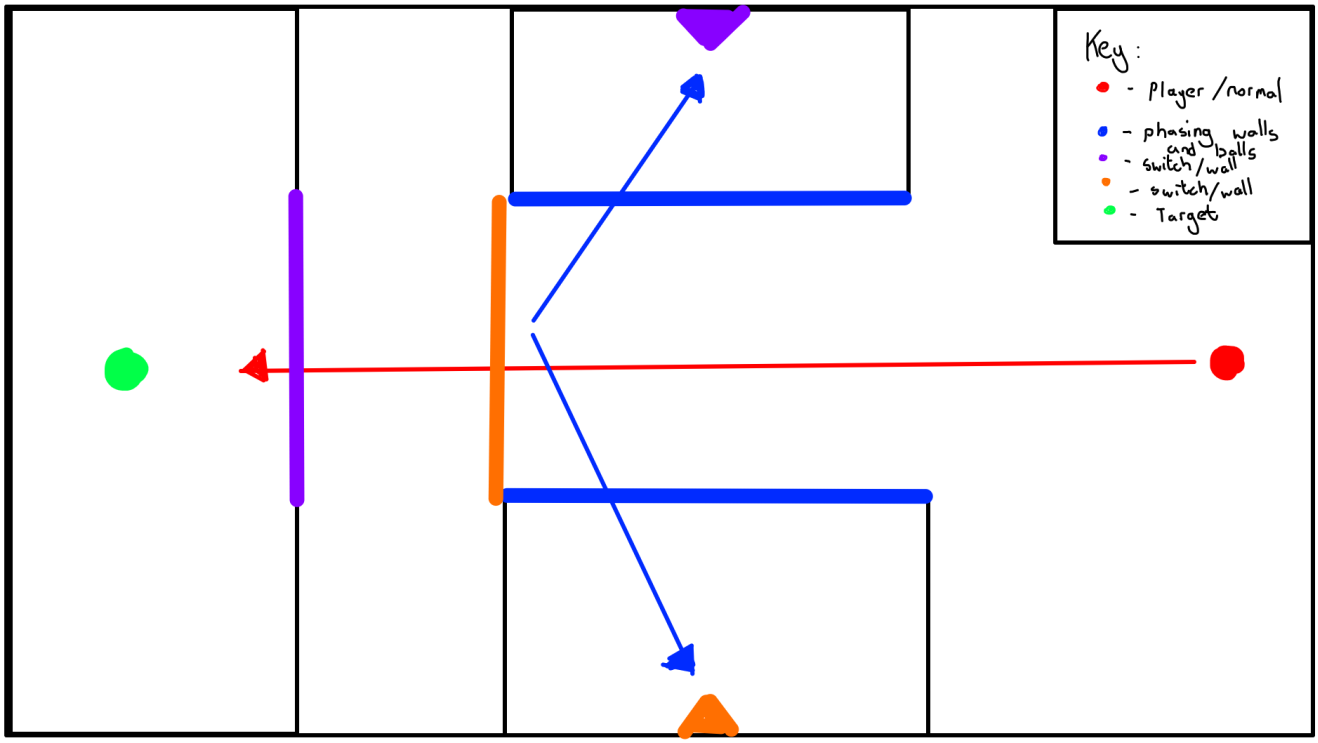


Figure 6 showing level design concepts for Level 3.

The third level concept's main intention was to create an emphasis on puzzle-based gameplay. The

player must complete the series of puzzles in a specific order to complete the level. The player must use the ability ball with phasing abilities to phase through walls and deactivate the different colour-coded walls in a specific sequence in order to achieve the objective of the game.

Level Concept Variations Volume 3 Designs and descriptions by James Theron

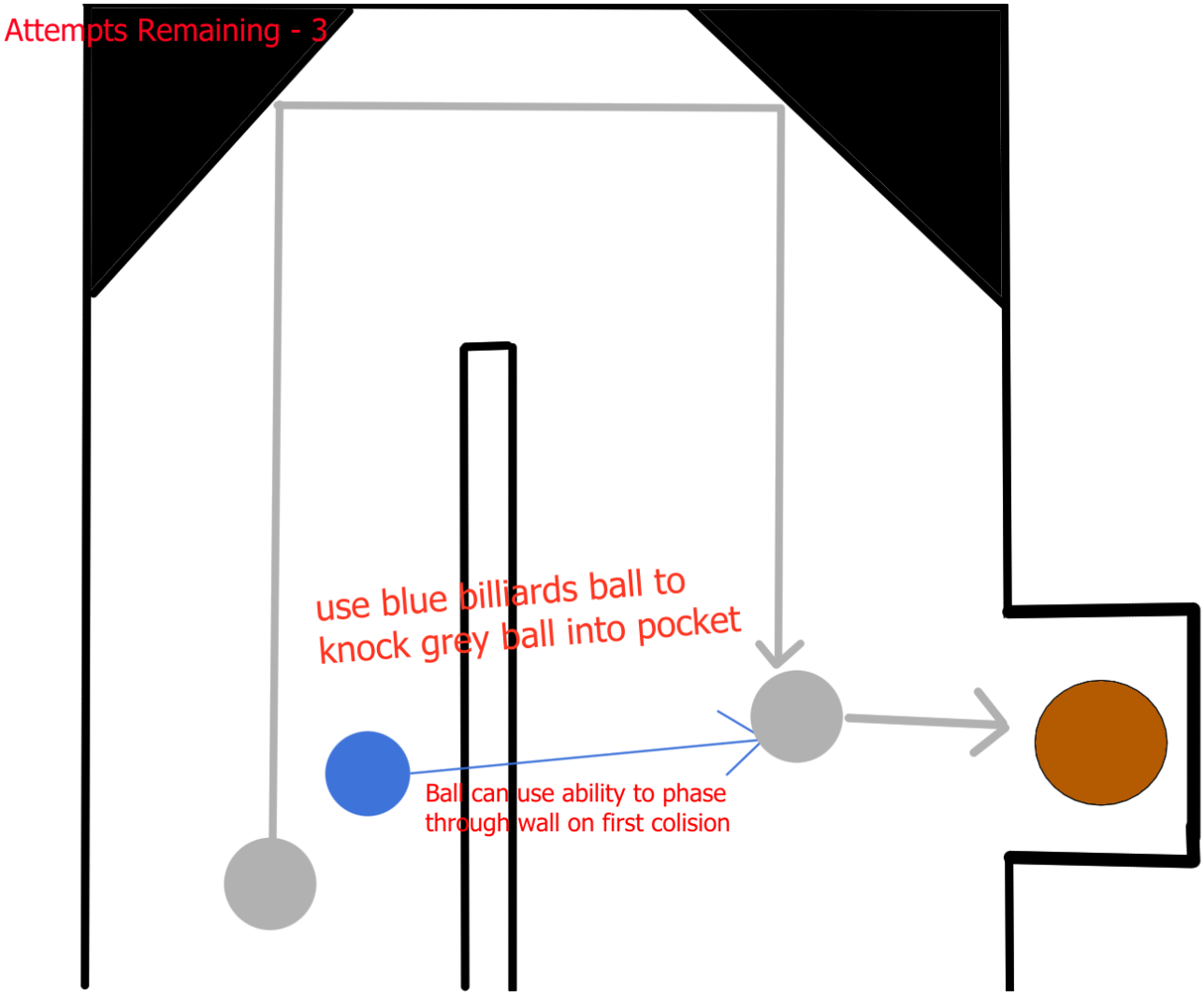


Figure 7: An early level depicting the phase ability

This initial level would be implemented for the sake of illustrating to the player the ability ball's ability to phase through certain walls. The grey circle represents the target ball, the blue circle represents the ability ball with the phase ability and the orange circle would be the pocket. The player must set up the target ball by hitting it in such a way that it reflects off of the angled surfaces and lands just in front of the pocket as illustrated by the grey arrows. The player must then use the ability ball to phase through the wall and knock in the target ball as shown by the blue arrows in the sketch. This particular course would likely give the player 3 opportunities to complete the stage.

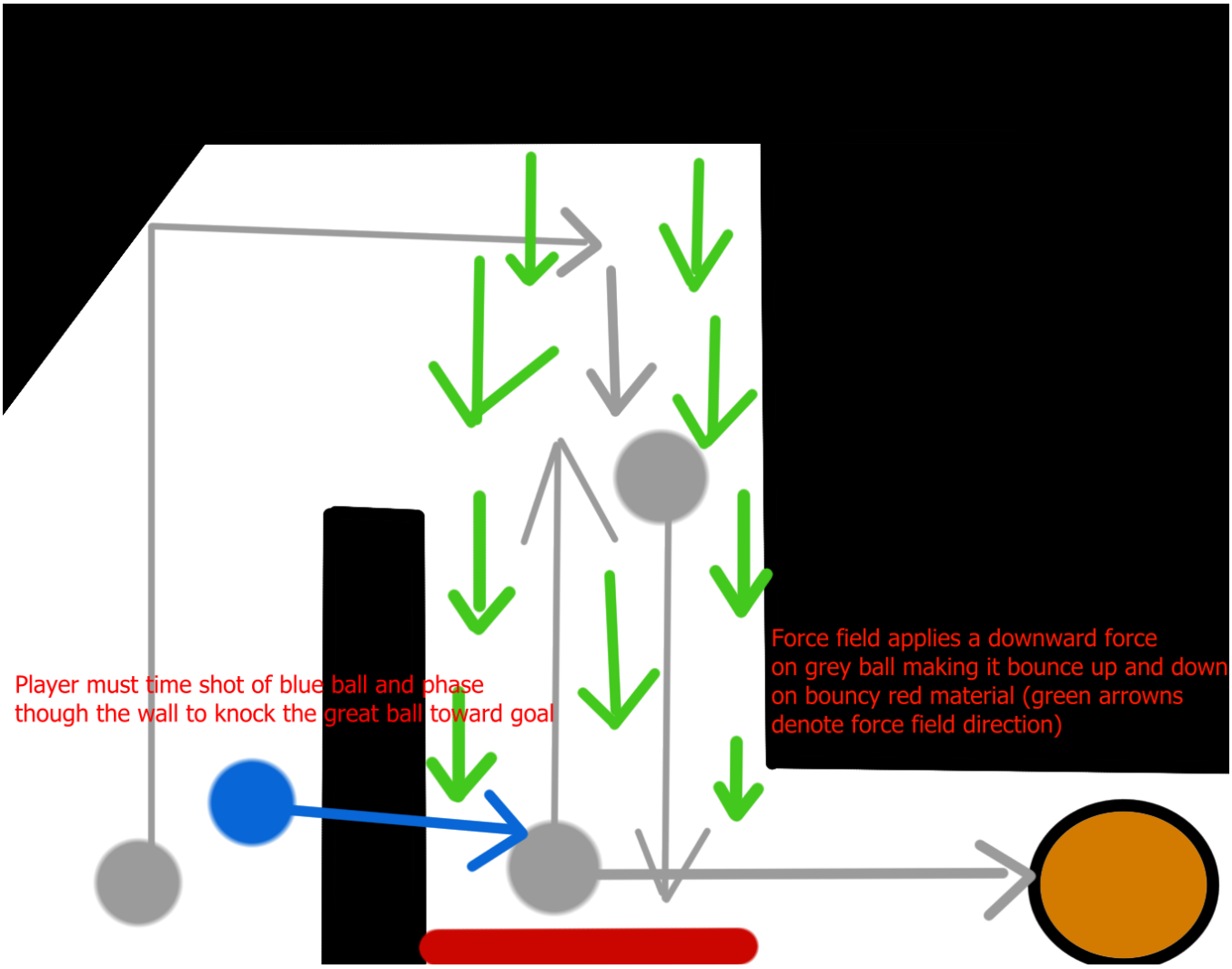


Figure 8: A level depicting the use of the phase ability and force field

Similar to the previous sketch, this course requires the player to use the phase ability of the ability ball to travel through a wall and knock the target ball into the pocket. In this instance, the green arrows show the presence of a force field which would pull the target ball in a downward direction. The force field coupled with the red bouncy material would initially cause the target ball to bounce up and down continually. The player must correctly time their shot with the ability ball in order to make the connection with the target ball and knock it in.

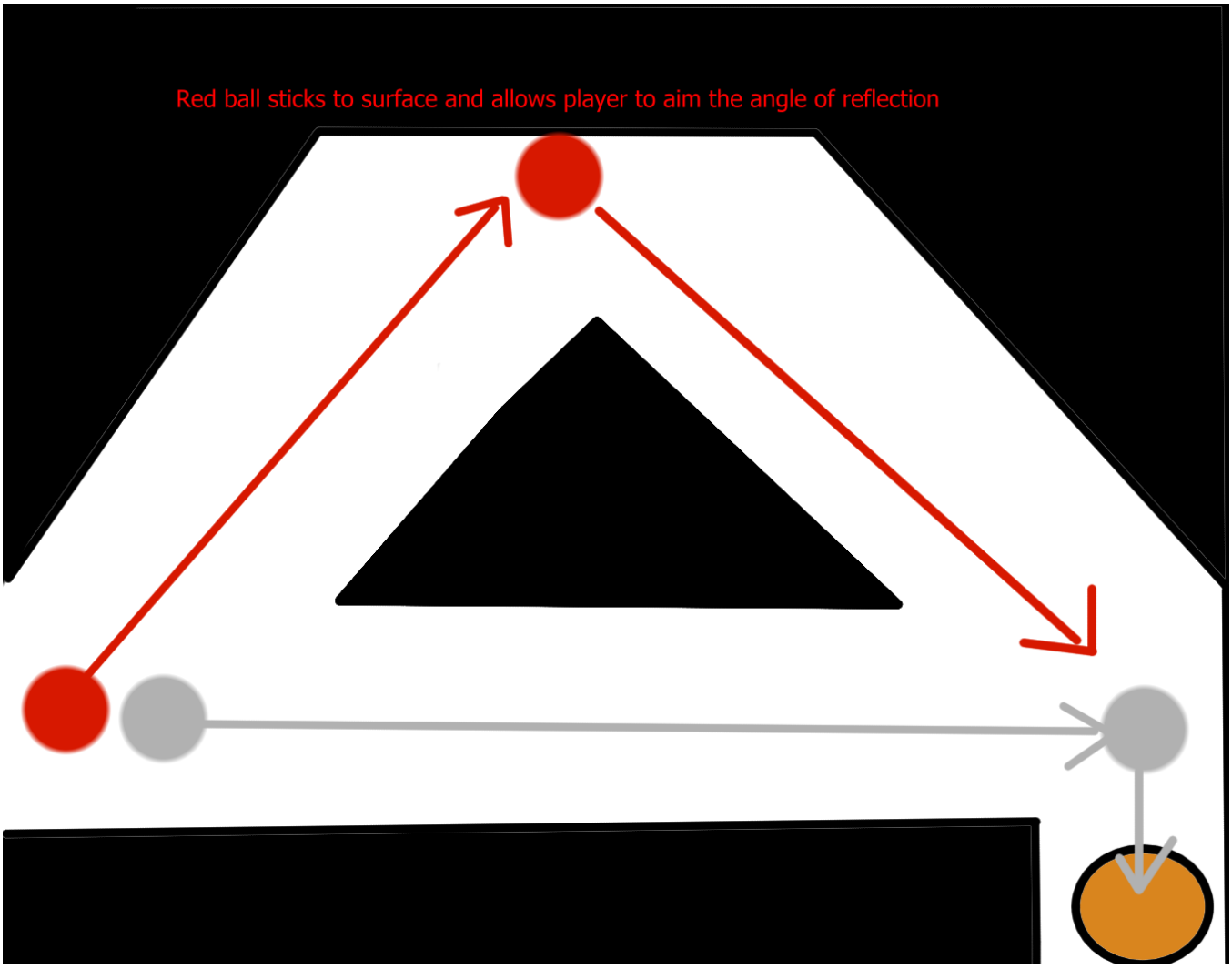


Figure 9: An early level depicting the sticky ability.

This stage is intended to illustrate to the player the ability ball's sticking ability. Th must first set the target ball by simply hitting it to line up with the pocket as shown by the first grey arrow. Since the player would potentially be limited to a single shot with the ability ball, they must use its ability to stick to the surface at the top of the level as shown in the sketch. This would allow the player to aim the angle of the reflection towards the target ball and knock it into the pocket in a single shot.

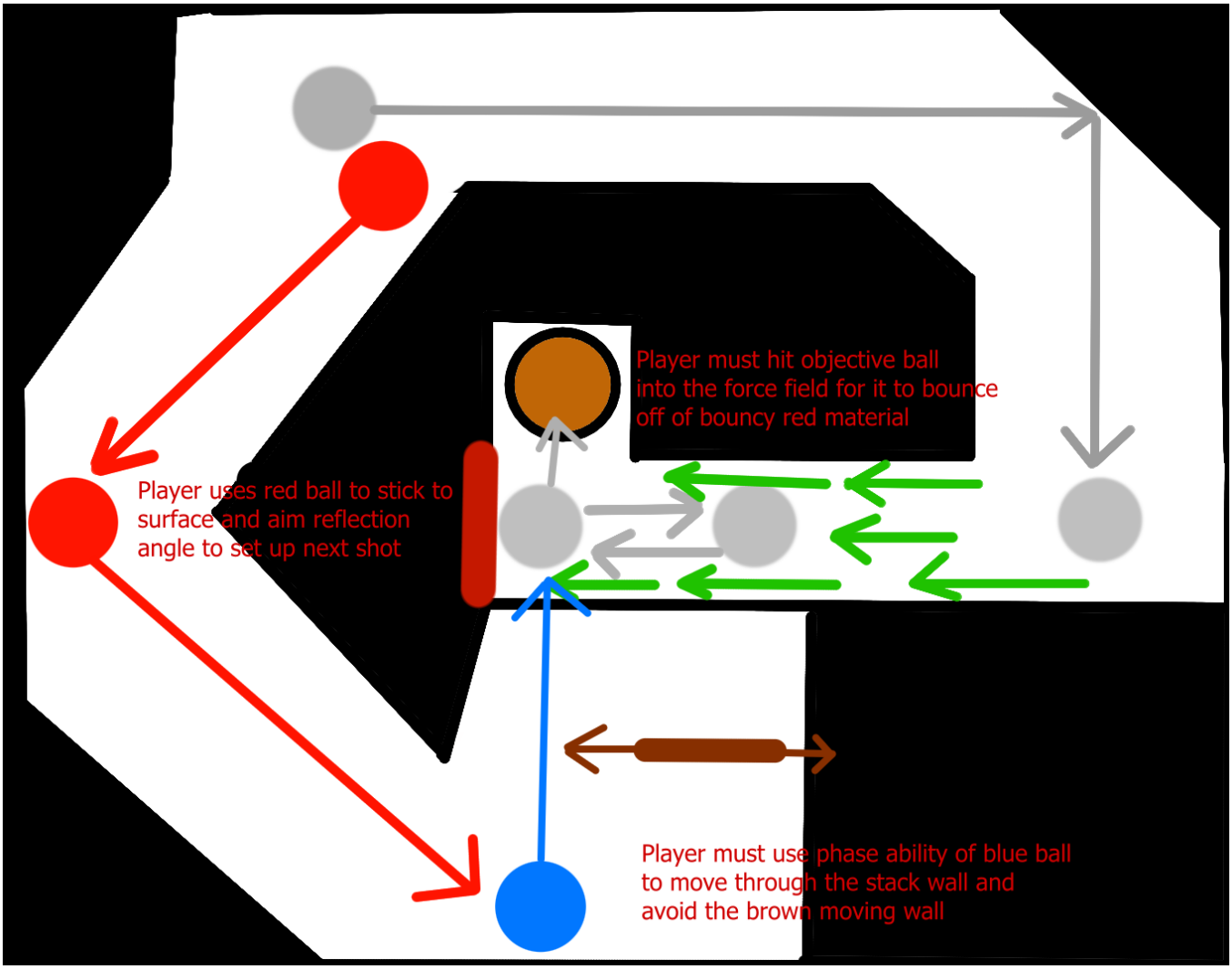


Figure 10: A more complex level requiring both the sticky ability and the phase ability

Figure 10 depicts a level of increased complexity which requires the player to use both the ability ball mechanics illustrated in earlier levels. Again, the player would hit the objective ball off of the reflective surface and into the force field causing it to bounce up and down off of the red bouncy material. The player would then proceed to use the sticky ability mechanic to position the ability ball as shown by the red arrows. The player would then have to use the phase ability to move through the static wall and knock in the objective ball into the pocket. The final shot needs to avoid the moving brown wall and be timed in such a way to hit the objective ball in the right moment during it's bouncing motion.

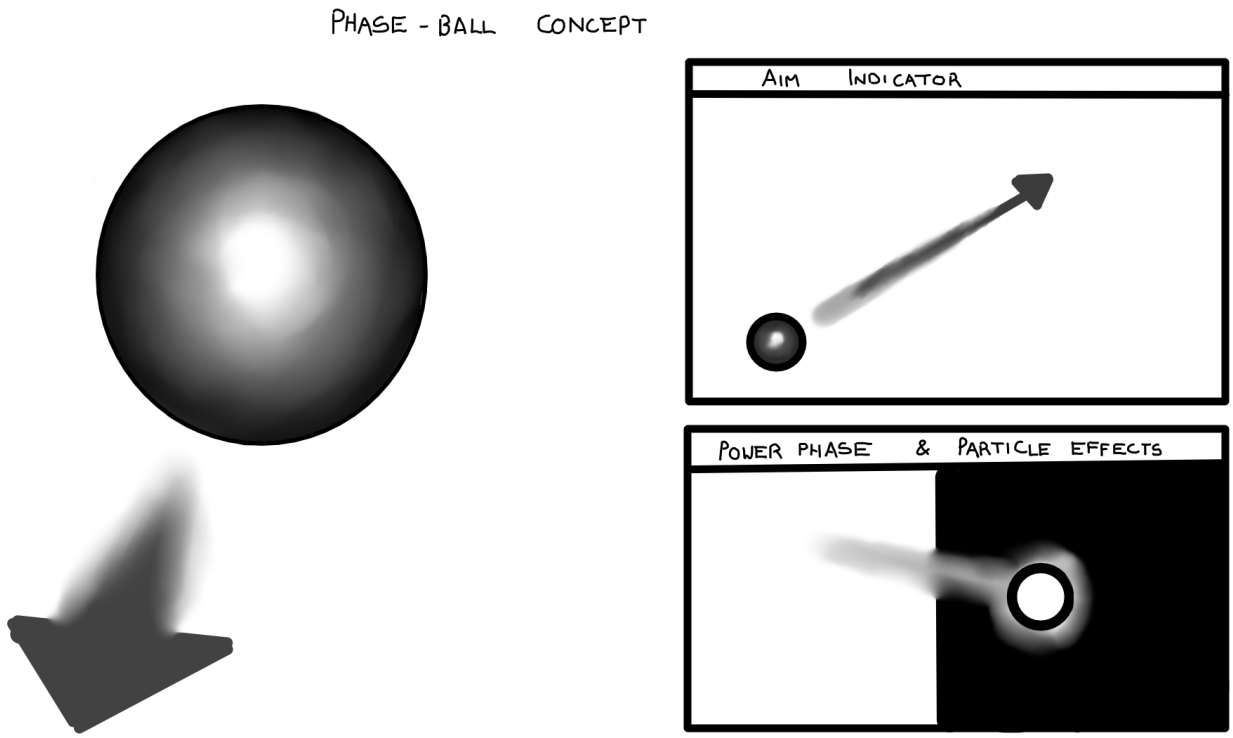
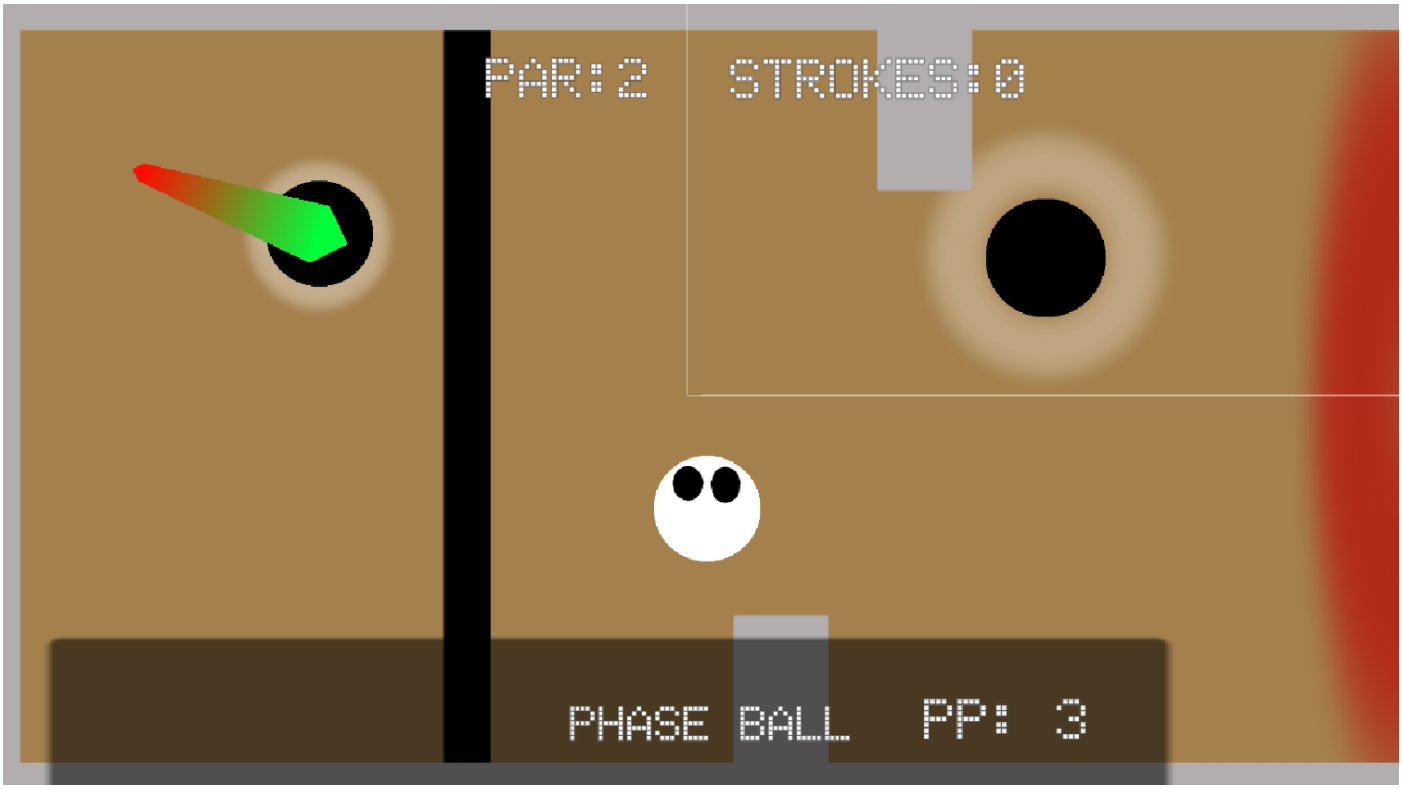


Figure 11 Image showing Phase Ball Concept Art and ability (Game Object and User Interface Concept Variations Designs and descriptions by Ashish Juggpall)



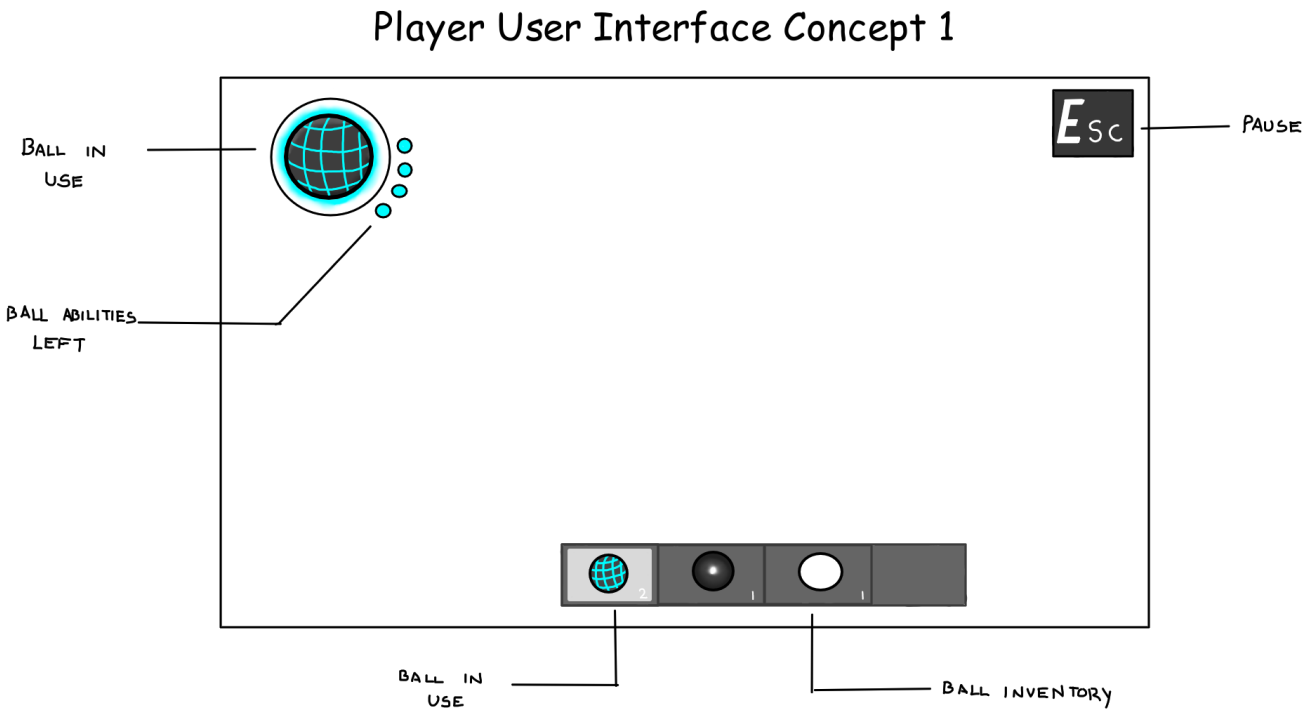


Figure 12 Image showing User Interface Concept Art that we most favour

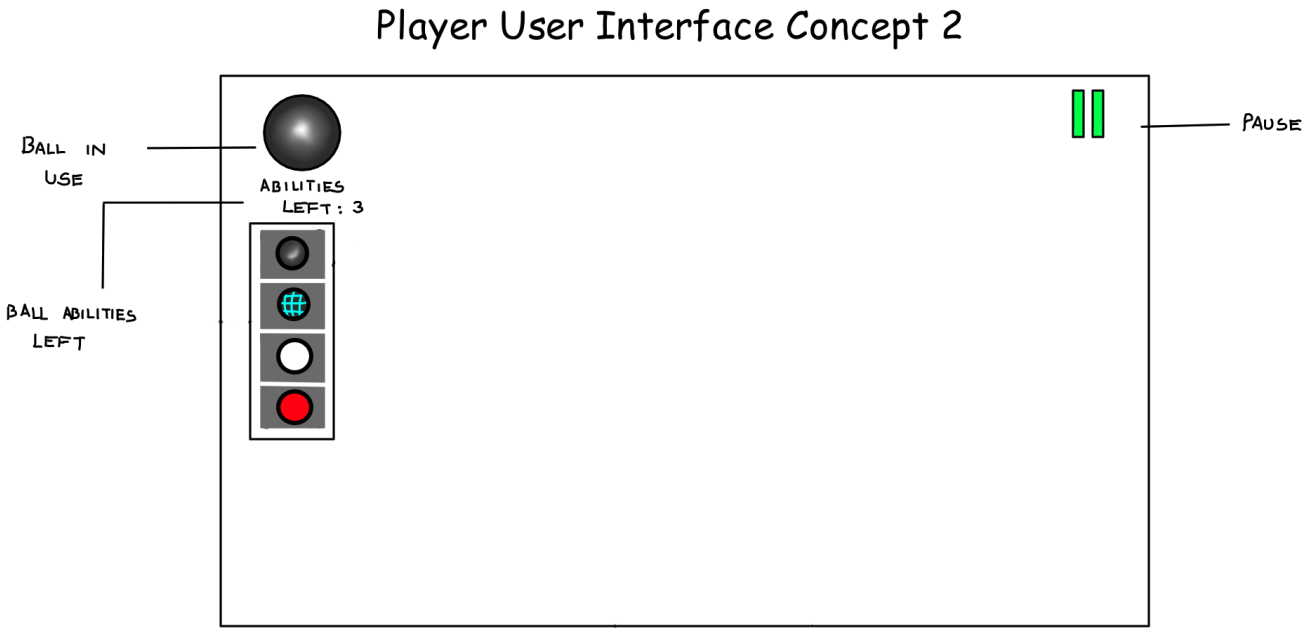


Figure 13 Image showing User Interface Concept Art that we least favoured but still acknowledge

Figure 14 screenshot of game play showing how the black phase ball can be shot through the black phase wall