BOOYO PARK

HEXA BYTE!

Final Documentation

By the members of **Hexabyte!**:
Keana Almario, Michael Arcadi, Justin Capcap,
James Pratt, Jennifer Stienstra, and Yani Wang

Capstone Project
In Partial Fulfillment Of The Requirements of GAME43796 & GAME49999
Honours Bachelor of Game Design
Sheridan College

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SHADOW FACTORY

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In Partial Fulfillment Of The Requirements of GAME43796 Game Project 2

Honours Bachelor of Game Design

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Acknowledgments

We would like to express our deepest appreciation for our production mentor, Professor **Jose Rueda**, for guiding us as we worked on a new and exciting project, and for opening so many doors for us.

We would like to thank our discipline-specific mentors, **Andrew Carvalho**, **Adam Clare**, and **Jonathan Standing**, for sharing their knowledge from their different points of view, allowing us to view the project in a holistic lens.

In addition, we would like to extend special thanks to the most senior executive of HP Canada, **Robert Venturo**, for providing us with technology that made this possible. We're honoured that he took the time out of his busy schedule to visit us in the studio and gave us insight into the roots of the project: the long relationship fostered between HP Canada and Sheridan College. We could not be more humbled.

When we decided to take on this project, we knew that we would be able to forge a friendship with **Shadow Factory**. What we did not know was how valuable and amazing this friendship would be. We express our gratitude to **Hans Bathija** for helping make this possible and being ever so supportive, even before we started. We would also like to thank our Hong Kong-based contact, **Keiran Lovett**, who checked up on the project's status via Skype every week despite the time differences. No matter how busy he and his team were with the release of their own game, Keiran always had time to talk to us. Thank you also to **Lindsay Holloway** and **other Shadow Factory friends** who joined our Skype calls to advise us in their respective fields.

Lastly, we would like to thank **Jiajia**, Yani's cat, for being the light of our lives.

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Executive Summary

Booyo Park is a location-based Mixed Reality “virtual petting zoo” experience, where the player is invited to play with creatures called Booyos. Typically, Booyos are invisible to the naked eye. However, with special equipment, the player can see and interact with them using their hands. The player can pick Booyos up, poke them, throw them, and merge them together if they wanted to.

The primary goal of this project is to fulfill the requirements of Sheridan College’s 4th year Honours Bachelor of Game Design capstone project. Additionally, the project aims to be a bridge between the relationship between Sheridan College, Shadow Factory, and HP. Lastly, this project intends to provide a unique design challenge for us to solve, pushing the limits of our design thinking further than with more traditional games and media.

Booyo Park by Hexabyte! (2019)

Background

Booyo Park originated as a venture between Sheridan College, HP, and Shadow Factory. Shadow Factory issued a design challenge to Sheridan asking them what were some potential applications of the HP VR Backpack in making location-based games. The members of Hexabyte! were interested in the prospect of working with a high-profile company such as Shadow Factory and took up the challenge.

Relationship with HP

HP is a multinational information technology company that develops hardware and software. *Booyo Park* is a continuation of HP's partnership with Sheridan College as a sponsor of the Honours Bachelor of Game Design.

As a sponsor of the program, HP provided much of the equipment used for *Booyo Park*, including the HP VR Backpack, HP MR Headset, as well as the workstations that *Booyo Park* was developed on. As partners with HP, *Booyo Park* and Hexabyte! are advertising the capabilities of HP's products. In addition, *Booyo Park* was featured as a part of HP's internal sponsorship video, and members from Hexabyte! spent time helping HP's video team by doing interviews and showing them around the Sheridan Trafalgar campus.

Relationship with Shadow Factory

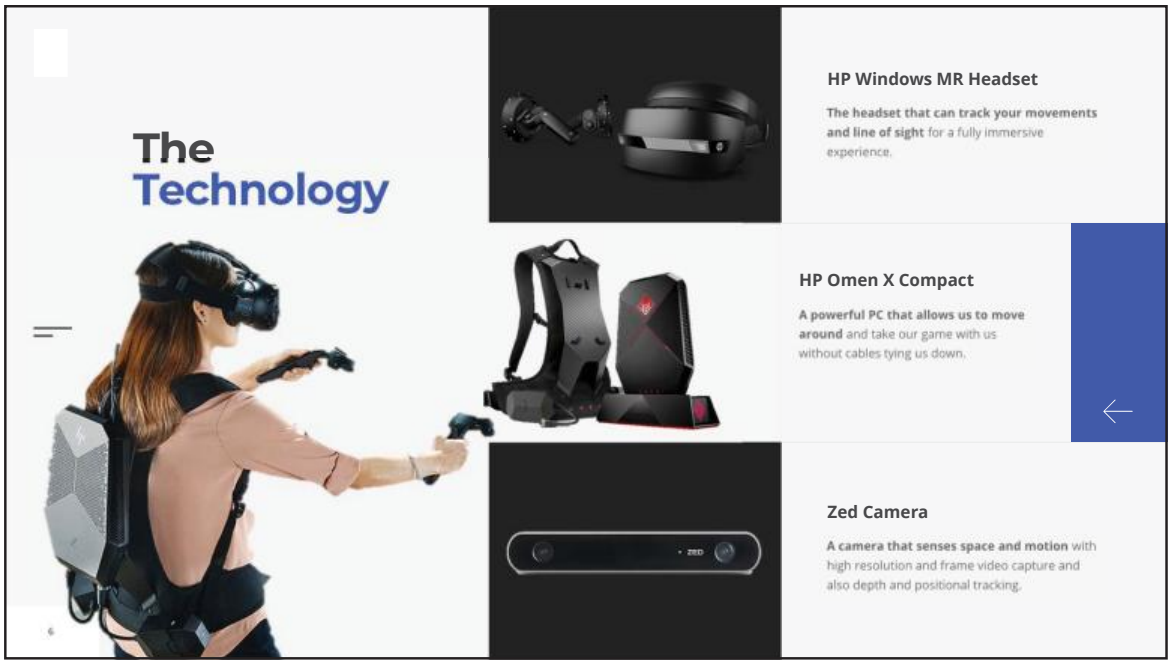
Shadow Factory is a business-to-business production company based in Hong Kong that creates VR, AR, and MR games and experiences. Our contact at Shadow

Factory was Keiran Lovett, a game and visual designer. Our relationship with Shadow Factory was very much one of a mentor and mentee. We had online meetings with Keiran every week when possible, where we would review the progress on our project and be advised based on our circumstances. He gave us valuable advice on all aspects of our project, and when we were at a specific point of our project, he would bring in a guest who specialized in that topic. It helped us immensely and it helped us grow our project in one single direction and goal. Through our partnership, Shadow Factory forged a relationship with Sheridan College, a prestigious institute of technology with innovative and creative students. By partnering with us for our capstone project, Shadow Factory can continue to grow their relationship with Sheridan College in the future.

Design Problem

Upon hearing that this project involved the use of HPs VR Backpacks, **Shadow Factory** issued the design challenge:

> "What would be cool in terms of gameplay in Virtual Reality (VR) that allows players to move around spaces, buildings, in other words, **without the restrictions of cables**?"



Equipment provided to us for this project.

Research

Our first step was to **consult previous teams** that worked with similar technology and platforms. This involved reaching out to the team that worked on the *Bit Heroes Connect* project (in collaboration with the York Regional Police) to gain some insight regarding their process. Since they were working on similar projects, we found that their advice really helped us in getting everything started in terms of tech. We also contacted Stereolabs, the company behind the Zed M stereo cameras, who helped us troubleshoot the camera and its compatibility with our other equipment.

The next step was to **research the medium**: What kind of games suits this technology the most? Our objective was to design a location-based experience. Because of that, we did extensive research on playground games. This involved prototyping different games while wearing the backpack computer and a GoPro camera. By doing this, we were able to answer a lot of questions regarding the overall experience: Can the players crouch? How well can they see? How freely can they move around? Despite how simple these questions seemed, they were vital in understanding the extent of the experience and how far we could take it.

We also explored how other physical tasks would work in VR/MR such as drawing, pointing, and other general hand gestures. We needed to understand the **level of interactions** that we could have in the game and how well it would work within a VR environment.

Design Challenges

Shadow Factory's challenge remained consistent throughout the year, yet we wanted to add our own take onto it. After researching the tech we were provided and what they were capable of, we realized that adding a multiplayer component to the game could be interesting, as one player could see things that other players could not. After that, our challenge became to create a **multiplayer Mixed Reality game that can be played in any indoor location**.

Asymmetrical Multiplayer

Our inclination towards multiplayer games was largely inspired by the game *Keep Talking and Nobody Explodes*. This game was an asymmetrical multiplayer game, i.e. the players played together, but they had different roles. It inspired us to create something similar, where two people could participate in even though they both had different circumstances. Our goal was that **people without the equipment could also enjoy the experience**.

For a while, asymmetrical multiplayer was one of the three core pillars that made up our game. We created many physical prototypes to help us fully realize this feature. Our earliest prototype was a **survival game** where one player (wearing the backpack and headset) was a general, while the other players (all holding VR controllers) were shieldmen. While we really liked this idea, we were unsure if players would appreciate getting barked at by one player, so it was scrapped.

One of the more realized prototypes was a **monster hunting game** where one player (wearing the backpack and headset) would be the monster slayer while the other player (without any tech) would be a monster expert. The slayer would relay information to the expert who had knowledge of the monster, who would then tell the slayer what to do. This was very similar to *Keep Talking and Nobody Explodes* where one player has all the information to defuse a bomb but does not know what the bomb looks like, where the other player has the bomb in front of them but does not know how to defuse it. We moved along far with this project, so much so that eventually we made several paper prototypes and came up with a physical "monster manual," yet we kept running into problems with player agency.

Why would someone want to be the expert and read a book when they could be the slayer and actually fight the monster? We realized that what was inherently what was holding the project back was the existence of an explicit goal. We were making a game when instead we should be focused on user experience (UX). We talked to Kieran about this, and he suggested that we **focus more on UX than the actual mechanics** as the medium of VR/MR lends itself better to more **open, player-driven experiences** than strict, mechanic driven games. From that point, we turned the concept around and developed what is now known as *Booyo Park*.

Location-Based Gameplay

A key component to our challenge was that **it should matter where the game is being played**. For instance, if the player walked from one area to another, there should

be a difference based on where they went. A good example of this is *Pokemon GO*, where players discovered different creatures depending on their location.

Early prototypes took advantage of this in terms of **having the player move around**. One of these prototypes was a game where players had to navigate a laser maze, try and steal priceless trinkets, and escape. The issue with this was that a game like this could potentially prove risky, as the expensive equipment could be damaged.

Moving onto *Booyo Park,* we struggled to find a solution to this problem: **How do we get moving around an area to matter to the player?** We tried having Booyos move around so players would have to walk towards them to interact with them, but playtests showed that it was frustrating to chase something that seems to be moving away from you. Also, this approached circled back to our original problem, where players who would chase after Booyos could potentially trip and injure themselves or break the equipment they are wearing.

We took on a new approach to this after talking with Jose, and we determined that **the solution did not have to be complex**. Basing the concept off of the fact that Booyos were animals, we made the design decision that Booyos would have regional differences based on where the player was while playing *Booyo Park*. For example, if a user is in the Sheridan Game Labs, the Booyos there would be teal, round, and friendly. However, if the user walked to the nearby gym, the Booyos would be yellow, slim, and energetic. With this design, we were able to address a crucial part of the design in a simple way.

High Scores

While *Booyo Park* was always intended to be an open-ended experience, we still had numerous playtesters request that we **include some sort of objective in the game**. One guest even recommended that Booyos could corrupt and go bad, similar to Sours in *Viva Piñata.* We were worried this would clash with the intent of our design, so we did not acknowledge it until much later when it became the most commonly-suggested feature from playtesters, mentors, and industry guests.

We bounced back and forth on various ways to include some sort of “goal” for players in forms of both mechanics and narrative. At first, we thought up a new character named “King Booyo” who would request that you watch over his children while he goes off and conducts kingly duties. This led to the game being named *Booyositter* for a while, as the user was quite literally **babysitting Booyos**. However, this came up late in development and we did not have the resources or time to implement the assets needed to make this work, so it was scrapped.

Next, we had the idea of having **Booyos change colour** when they merge. For example, merging a red Booyo with a blue Booyo would result in a bigger, purple Booyo. The design of this mechanic was fully developed, with charts on how the mixing would work and even a spot in the game design document that fully explained it. However, much like King Booyo, we simply did not have enough time and resources to allocate in order to complete the mechanic so eventually, that was scrapped as well. However, the idea of different colours of Booyos came back in the form of regional differences of Booyos, which was explained in the section above.

Our last and final idea was actually briefly mentioned as a joke during one of our production meetings. The idea was that we would simply not limit the amount of Booyos that could be merged, and that Booyos would pop into smaller ones over time. **When a Booyo pops, it would show a number that reflected it size - essentially presenting the player's score.** The game does not record this number and there is no in-game record of it, but since *Booyo Park* was designed to be played in public events, we could simply write down the highest number we see and display it as a challenge to people waiting in the queue to play. We somewhat tested this idea out at the Oakville Library Playtest (we did not have a whiteboard so we could not record numbers) with surprisingly great results. Once people learned of a challenge within the game, people would participate and **compete to have the highest score**, even if there was no prize for doing so. By adding this simple number, we added an incentive to perform one of the key actions in the game without compromising its open and explorative design.

Solution

After rigorous design and testing, we came up with our project's pillars, or the foundations that would guide the design of the game:

1. **Movement**. How do we encourage the player to move around the real space?
2. **Magical Realism**. How do we make the player feel that they are in the same realm as fantasy creatures?
3. **Hand Interaction**. How do we facilitate the use of hands instead of controllers? How do we create intuitive controls that players could instantly pick up without prior knowledge?

Our solution to Shadow Factory's design challenge was *Booyo Park*, which is a fun location-based experience that engages users and lets them play and move around freely without being restricted by cables. The HP VR Backpack computer lets players move around a room and play with Booyos without being tethered by a typical desktop. Booyos change colours and look different depending on the location of the player. For the multiplayer element, we used mirrored display on a monitor to show the audience what the player was currently seeing and engage with them because they could also see what was happening.

Recommendations for Future Work

Research

One of the earliest pieces of advice we received while developing the project was, **"You don't know what you don't know."** This was from Raphaël Tétreault, who previously worked with the HP VR Backpack and Windows Mixed Reality Headset for a project with the York Regional Police Department. We strongly recommend that any team that wishes to pursue a similar project in the future to dedicate a significant chunk of development time into researching not only the equipment but also VR/AR/MR design (collectively known as XR). Prior to working on this, only one team member had any experience working with XR. Now that the project is complete, any member of the team can more or less describe how the equipment works and why certain decisions work within the medium. Taking ample time to research, document, and prototype will prove rewarding.

User Experience (UX)

For developers who may find themselves tackling similar design challenges, the first thing we recommend is focusing on user experience (UX). Any XR experience has the potential to make the player uncomfortable, especially if they will be wearing a lot of equipment. What we recommend in the future is **creating an experience that goes beyond just the actual game** or product itself. Much work went into creating the overall experience, from the moment they see the booth to when they leave. A narrative was created to support this and to tie everything together. Roles were also assigned to each

team member and given specific instructions on what they had to do during a showcase to ensure that everything ran smoothly and that the users were comfortable and happy.

Prototype

Another important recommendation we'd make based on our experience during the development of *Booyo Park* is to **allow plenty of time for prototyping**. This is especially important when using unfamiliar technology. Take the extra time not to test game ideas, but separate mechanics to see if they'd even work with the medium. Then, try testing some mechanics together, too. This phase helped influence the design decisions we made later on, and it also helped to give us much-needed direction. While a lot of time is needed for prototyping, it saved our team a lot of time and energy in the long run.

Glossary

Term	Description
Booyo	Our cute creatures that you interact with in *Booyo Park*.
VR	Virtual Reality. All of your surroundings are virtual, and you are isolated from the real world. References: *Beat Saber*, *Superhot VR*
AR	Augmented Reality. You see virtual objects on top of the real world. The virtual objects are unaware of the real world around them. References: *Pokemon GO*, *IKEA Mobile* app
MR	Mixed Reality. You see virtual objects on top of the real world. However, the virtual objects *interact* with the real world. References: Magic Leap
XR	Extended Reality. This is the umbrella term for all kinds of computer-altered realities, including VR, AR, and MR.
UX	User Experience. Encompasses the emotions and actions of the player when they participate in a product.
Pillars	Pillars are what the game or experience at its core. The design of the rest of the project built around them.
Location-based	The changing of content depending on where the user is located.
Zed M Camera	A camera that senses depth and allows us to have our game in AR.
Leap Motion	A device that detects your real hands and allows you to use your hands as controllers in video games.
HP	Hewlett-Packard. Multinational information technology company.

References

Reference	Reasons for Inspiration
Shadow Factory	Our design challenge was provided by Shadow Factory and was the foundation of the project.
GrabBag (2018)	This game is developed by Shadow Factory, the team's sponsor for this project, and uses tech similar to what we used.
Playground games	Physical playground games inspired us because the users have freedom of movement, which was what we were hoping to have for the project.
Kinect/Wii games	The games on these systems were also an inspiration because they are digital games that allow freedom of movement
The Void / Escape rooms	We were inspired by these games as they took place in a physical space and also encouraged movement. The Void in particular also utilized some of the same tech we did.
Keep Talking and Nobody Explodes (2015)	A VR game that focuses on asymmetrical multiplayer. Early on in the project, we were very inspired by this game and its innovation.
Slime Rancher (2016)	A game where you interact with cute blobs, which is very similar to our concepts.
Viva Pinata (2006)	We were inspired by how piñata would turn into evil sours at a point in development.

Appendices

Appendix A: Game Design Document

- This document outlines **all the information** about the **design of the entire project**. We used it consistently to refer back to it for more information about design decisions.

Appendix B: Technical Design Document

- The technical design document was made by the technical designers to **track the research and data** they collected while using and working with **all the technology** we had. It includes their documentation for the Windows Mixed Reality headset, Leap Motion, Zed M camera, and the HP VR Backpack.

Appendix C: Art Guide

- This guide was made by the artists to **decide, check, and design the art style** for the project. It includes guides on art, models, textures and overall aesthetics.

Appendix D: Production Documents & Diagrams

- These are various documents and diagrams **used internally** to **explain and illustrate ideas** to other team members.

Appendix E: Team Charter

- This document was made to **fully outline the project's objectives, outcomes, deliverables, organizations, and risks** so we could get **approval** of the project from our program and faculty.

Appendix F: Development Logs

- These development logs showed our design thinking and process throughout the project. Each team member had a **personal blog** where they would write **updates** on the project, **problems and solutions** they ran into, etc.

Appendix G: Prototyping Notes

- These notes were ones we made during our **initial design period.** We were still unsure of the direction we wanted our game to go, so many of these are notes reflect our **brainstorming process**.

Appendix H: Playtesting Reports

- These reports were made **after each playtest session to record data** that was collected. It includes the moderator script, metrics, in-game observations, data from surveys, and recommendations.

Appendix I: Meeting Notes

- These are notes from **various meetings** we had over the course of the project. We used these notes to **remember the decisions we made and the reasons behind them** for each meeting, as well as images of the original notes we took.

Appendix J: Documentation of Public Events

- These are notes that we took to **explain the public events** we went to, with accompanying photos.

Appendix K: Presentation Materials

- These are each of our slideshows during the project. This is what we **presented to various guests** each week, based on a variety of prompts. Since we had new guests every week, we would introduce the project and the team every time.

Appendix A: Game Design Document

This document outlines **all the information** about the **design of the entire project**. We used it consistently to refer back to it for more information about design decisions.

BOOYO PARK

GAME DESIGN DOCUMENT

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS

OF GAME43796 GAME PROJECT 1

FOR SHERIDAN COLLEGE

KEANA ALMARIO, MICHAEL ARCADI, JUSTIN CAPCAP, JAMES PRATT, JENNIFER STIENSTRA, YANI WANG

LAST UPDATE: APRIL 8, 2019

REVISION HISTORY

REV. #	DATE	AUTHOR	CHANGES
23	Apr 8, 2019	James	-Reworked GDD to reflect the overall project instead of just the current slice
22	Apr 3, 2019	Jennifer	-Updated narrative
21	Apr 2, 2019	James	-Reviewed GDD to match the final version of the game
20	Feb 5, 2019	Jennifer	-Updated GDD to reflect new name and changed narrative
19	Jan 24, 2019	Jennifer	-Updated GDD to reflect new game name aka Booyositter -Updated GDD to reflect new narrative
18	Jan 24, 2019	James	-Added 3.4 Colour Merging Section under Section 3. Game Mechanics -Fixed the year on one of the revision history entries
17	Jan 15, 2019	Jennifer	-Updated entire GDD to reflect new scope as well as the name of the creatures aka Booyos. -Updated to reflect the final name of the project aka Booyo Park
16	Dec. 4, 2018	Jennifer	-Updated the Story Overview/Synopsis
15	Nov. 29, 2018	Jennifer	-Added Section 7: Important Documents, along with the tech design doc draft, and several playtesting documents.
14	Nov. 27, 2018	Jennifer	-Updated Personas, Levels, & Marketing Analysis
13	Nov. 23, 2018	Jennifer	-Updated sound direction, music, bibliography, and target demographics. -Added Charles Finlay, Program Coordinator of MASSIVE to contacts under Others.
12	Nov. 19, 2018	James	-Added new pillar. -Rephrased the wisps into blobs.

11	Nov. 2, 2018	Jennifer	-Updated Project Vision, 1.1.7 Game Characters, 1.1.11 Localization Plan, added Microsoft contact Nicholas Victoria under 5.1.3 Others.
10	Nov. 1, 2018	Jennifer	-Updated Section 3.1.1 Interactions to reflect the results of physical prototypes.
9	Oct. 15, 2018	Yani	Filled out the following sections: Game Format, Art Direction and Project Vision.
8	Oct. 4, 2018	Jennifer	-Updated Keiran's contact information.
7	Oct. 3, 2018	Jennifer	-Moved contents from 2.7 Bibliography to 6.0 Bibliography and deleted the former section.
6	Oct. 2, 2018	James	-Edited core game concepts.
5	Oct. 2, 2018	Jennifer	-Edited bibliography. -Edited game engine.
4	Oct. 1, 2018	Yani	Changed the theme and some formattin.g
3	Oct. 1, 2018	Keana	Fixed the formatting.
2	Sept. 28, 2018	Keana	Transferred GDD from Google Docs to MS Word.
1	Sept. 20, 2018	Jennifer	- Created the GDD. - Added headers for each section. - Added list of contacts.

TABLE OF CONTENTS

1. PROJECT OVERVIEW

1.1. PROJECT VISION

Booyo Park is a mobile Mixed Reality "virtual petting zoo" experience where the player is invited to play with creatures are invisible to the naked eye. With the headset and tech, the player is standing in the middle of several small, cute slime-like creatures and can interact with them with their hands. For example, the player can pick them up and throw them if they wanted to, or hold them and merge them with another Booyo. The team mainly wanted to focus mainly on user experience when playing the game, and also wanted to show people the wondrous possibilities of Mixed Reality.

1.1.1. CORE GAME CONCEPTS

Booyo Park is built upon these gameplay pillars:

Magical Realism

Freedom of Movement

Hands as a Controller

Magical Realism: The team wants to make the user feel like they are looking into a hidden, fantasy world that rests on top of the real one. This pillar reinforces that every design decision the team makes should help boost this.

Freedom of Movement: *Booyo Park* will allow the player to move around freely in a virtual space.

Hands as a Controller: *Booyo Park* will use the players own hands as an interface with the game world as opposed to traditional gaming controllers

1.2. GAME GENRE

Booyo Park will be a MR **digital pet** experience.

1.3. PLAY TIME

Play time will be roughly around **1-3** minutes.

1.4. TARGET PLATFORM

1.4.1. GAME ENGINE

For the development of this project, the team will be using Unity as their engine.

1.4.2. SYSTEM (HARDWARE) REQUIREMENTS

Windows 10

158 MB of Memory

Dual-Core 2,3GHz or faster Processor

4 GB of Ram or more

Nvidia GPU with compute capability > 3.0

GTX 1070 graphic card recommended but will work with lower.

1.4.3. GAME FORMAT

Booyo Park is unique because the team is not making a very “traditional” video game in a sense. Since they see the project being a location-based experience, they are aiming to show it at brick and mortar public locations. Places like at a mall kiosk or store, or at a gaming / technology convention would be ideal for the game.

1.5. ART DIRECTION

For the art direction of the *Booyo Park*, the team has decided on a simplistic, cartoony art style with a focus on a soft, bright, colour palette and optimization. Because the project is in MR, optimization of all assets is essential. The team is planning to create low-poly assets with flat textures. The team wants to avoid in game shadows to avoid lighting clashes against the real-world shadows. They also want to minimize the variety of characters, because they have limited experience modelling and animating character models. Refer to the mood board below for a general guideline of the art direction the team is pursuing.

Figure 1 Booyo Park mood board

1.6. AUDIO

Link to the Audio List

1.6.1. SOUND DIRECTION

The majority of the sounds in the *Booyo Park* will center on the Booyos. The team hoping to get some Foley sounds such as wobbling for the movement of the creatures. They will also have sounds, such is chirps and giggles to correspond to the moods of the Booyos.

Overall, the tone of the sounds should be magical, cute and bubbly. The team is moving away from a more fantasy-like sound and towards the direction of something similar to Animal Crossing.

The sounds made by the creatures will be sampled and edited by the MASSIVE students Ryan Maxwell and Jason Stamatyades.

1.6.2. MUSIC

For the soundtrack, the team is looking for light-hearted ambience to play not only in the background while the user is playing with the Booyos, but to also attract curious passerbys who may want to try the experience. The soundtrack will be the responsibility of the MASSIVE students the group has teamed up with, Ryan Maxwell and Jason Stamatyades.

1.7. PROJECT SCOPE

The project will cover a vertical slice of *Booyo Park*, highlighting the core concepts and mechanics that would be present in the full experience. This will allow the team to showcase everything the game has to offer while at the same time working within a smaller scope.

1.7.1. GAME CHARACTERS

Booyo Park will feature many virtual characters that the player can interact with called Booyos. They are slime-like teal creatures that float around the player. These characters will have the ability to react to the player based on their hand motions as detected by the Leap Motion.

1.8. MARKET ANALYSIS

Booyo Park can best be described as a mix between VR and AR, both of which have had financial success. The Void, for example, is a VR simulation that produces VR content and engages players to move around as they play. They have become so successful that they recently teamed up with ILMxLAB to produce Disney and Marvel licensed titles including Star Wars and Ralph Breaks VR. AR has also seen its share of success. Pokemon GO, a game about capturing creatures in a real-world space and is played all around the globe, recently surpassed a total revenue of $2 billion dollars.

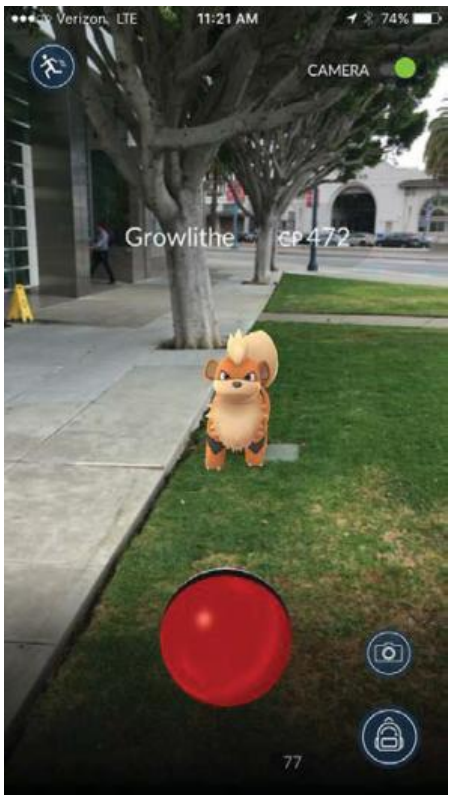


Figure 2 *Left:* Poster for Ralph Breaks VR at the Void.
***Right:* Screenshot of Pokemon GO.**

1.8.1. TARGET DEMOGRAPHICS

The target demographics are families with young children and groups of teenagers. The team is aiming to make an experience that would be showcased at a mall, where those demographics are concentrated.

1.8.2. PERSONAS

Persona 1: Dana Smith	Teenage girl currently in the 11th grade. Her favourite subjects are cosmetology and English. She likes to talk with her friends on the phone and uses Snapchat as her primary means of talking to them. Dana often goes shopping and hangs out with her friends at the local mall.
Persona 2: Colin Graham	Father of two children, an 11-year-old daughter and a 9-year-old son. He is busy with his job during the week, but on weekends he spends time with kids and bonds with them by both playing games with them and watching them play too.

1.9. PROJECT RISKS

R1. The technology is fairly new, meaning users might be intimidated by it and not want to play.
R2. Hardcore audiences might be put off by the relaxed, easygoing nature of the game.
R3. The user may injure themselves while walking around with the game, and possibly harm the equipment as well.
R4. The game has to be able to be played in different environments.

2. STORY OVERVIEW

2.1. STORY GENRE

The genre of *Booyo Park* is magical realism, taking place in a realistic setting but there are aspects of fantastical elements. This genre works well with the MR headset, since the team is able to blend the real world and virtual world together.

2.2. STORY OVERVIEW / SYNOPSIS

Booyo Park is a virtual pet sim in which players are enabled through technology to gaze into an unseen world where adorable creatures called Booyos exist. Invisible to the naked eye, Booyos are adorable and social creatures that love to play with humans.

2.3. SETTING

Booyo Park is set in whatever brick and mortar location the setup is in. The purpose of the backpack and MR headset is to “reveal” the mystical creatures that are always around them but are invisible.

3. GAME MECHANICS

3.1. PLAYER CONTROLS

The player is mainly interacting with Booyos flying around them by using their hands. This will be achieved by utilizing the advanced hand tracking of the LEAP motion camera.

3.1.1. INTERACTIONS

BOOYO INTERACTIONS	
Picked Up	Players can hold and move Booyos by grabbing them with their hands. Booyos will follow the player's hand position as long as the player holds their grip on the Booyo
Thrown	Players can throw held Booyos a short distance. Booyos will follow their path of travel until their momentum stops or they collide with another Booyo.
Poked	Players can lightly poke Booyos with their finger. Booyos will react accordingly with different faces or responses.
Pushed	Players can push Booyos with their open hands.
Merging	When Booyos collide, they play a short animation and merge into one, slightly bigger Booyo. Players can continue merging Booyos with the merged Booyo getting bigger and bigger.
Popping	After a short time after merging, Booyos will start to turn red until they eventually shake and pop into several smaller Booyos. A number representing the number of Booyos merged to make the big Booyo comes out as well. The number of these smaller Booyos spawned is the amount of Booyos that merged in order to create the bigger Booyo. The amount of time it takes before popping decreases per Booyo used to merge.
Splitting	Players can karate chop Booyos to manually split Booyos in two Booyos if they have absorbed any Booyos.

3.1.2. MOVEMENT AND AIMING

Since the team is working with Mixed Reality, player movement in game is carried out by maneuvering within the actual physical space. The same principle applies to looking around within the game space where the player will be aiming relative to their head position.

3.2. CAMERA SYSTEM

The game will utilize the ZED M camera to allow players to play the game using augmented reality from a first-person perspective as they view the real world through the headset. The ZED M Camera has a resolution of 2560x720.

3.3. ARTIFICIAL INTELLIGENCE

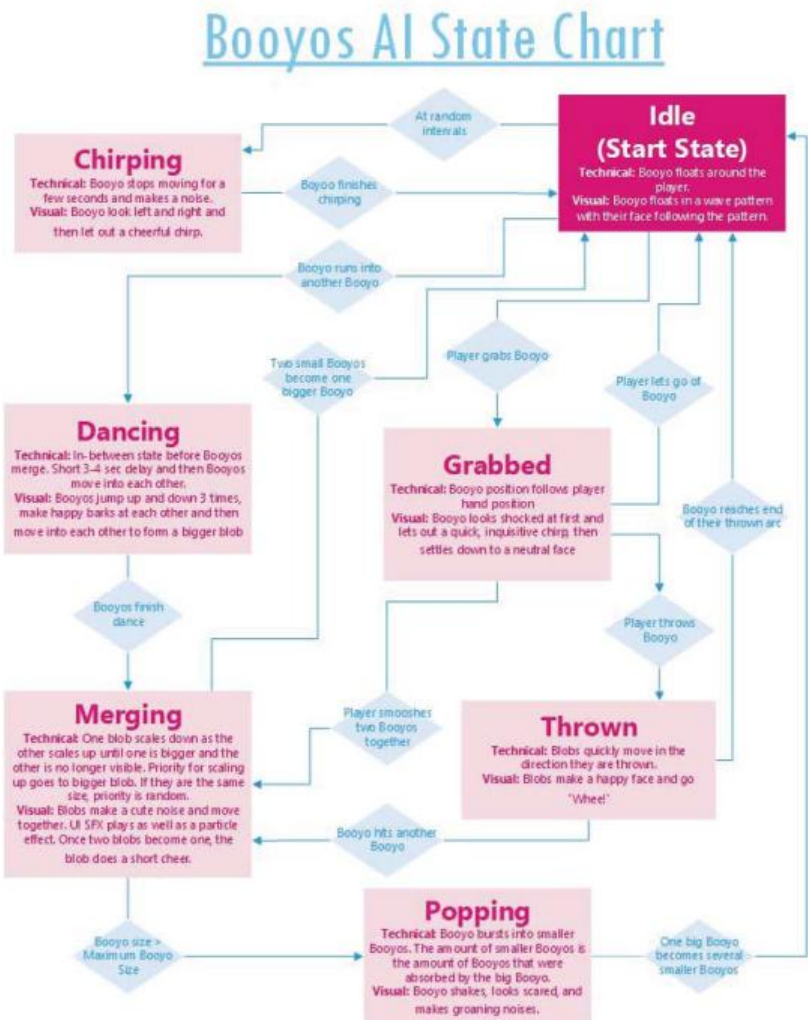


Figure 3 AI behaviour Chart of the Booyos

AI behavior in *Booyo Park* is exhibited by the flying Booyos around the player. Essentially they will keep wandering around unless the player decides to interact with them. Only then will their behavior transition to another state.

3.4. DIFFERENT SPECIES OF BOOYOS

In order to fulfill the location based component to the challenge issued by Shadow Factory, Booyos in different areas possess different traits such as their behaviour, colours, or shapes. Players can take the backpack and wander around a location and find different Booyos based on where they are.

For example, Booyos in the Sheridan Game Labs are teal and friendly, following players as they roam around. However, Booyos found in a theme park are pink and energetic, hopped up by the thrill of rollercoasters and the rides.

These differences in species encourage players to explore and find new Booyos in an area, such as a mall. Booyos near a food court might be a bit pudgier than Booyos near a sports store, which might be a bit slimmer or shaped like sports equipment.

Figure 4 Illustration showing how Booyos in different areas would work. Top left is Sheridan Game Labs, Top Right is a theme park, bottom left is a food court and bottom right is a sports store

4. GAME PROGRESSION

4.1. GAME ELEMENTS

Players will progress through *Booyo Park* as they learn the different ways in which they can interact with the Booyos. These methods of interaction with the Booyos will be learned from experimentation.

4.1.1. CHARACTERS

Figure 4 an image of a Booyo

Booyos are small **cute, friendly, non-threatening** blobs that float around the player and make noises. They can only be seen if the player is wearing the special headset and backpack.

They are social creatures that will gravitate towards the player if they wander too far. Players can play with them using their hands. Booyos love to be poked, held, thrown and merged together into a bigger Booyo.

5. DEMO VERSION

The team will be showcasing the game at Level Up Showcase on April 17th, 2019. There, the team be showing off a vertical slice of the game and not all the features mentioned in this document will be present.

The features that will not be in the Level Up showcase build are:

- Manually splitting Booyos
- Different species of Booyos
    - Note: the idea is that the Booyos that are seen in the Level Up showcase are the ones that are native to that area.

Any features/mechanics/systems that were not listed are present in the demo version of the game.

6. MISCELLANEOUS

6.1. CONTACTS

6.1.1. GAME DESIGN TECHNOLOGISTS

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6.1.2. MENTORS

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- Shadow Factory Email (preferred): keiran@shadowfactory.io

6.1.3. OTHERS

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MASSIVE Audio Members: Ryan Maxwell and Jason Stamatyades

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- Jason's Email: jasonstam@gmail.com

7. BIBLIOGRAPHY

Below are some references that inspire the team for this project.

NO.	Reference	Reasons for inspiration
1	Shadow Factory	The team's design challenge was provided by Shadow Factory and will be the foundation of the project.
2	*GrabBag* (2018)	This game is developed by Shadow Factory, the team's sponsor for this project and uses tech similar to what they'll be using.
3	*Slime Rancher* (2016)	The team likes design of the slime creatures, and are using them as inspiration for their own creatures.
4	Chao Garden from *Sonic Adventure 2* (2001)	The team likes the design of the creatures from Chao Garden and are using them as inspiration for their own creatures.
5	Tag, Hide and Seek, Treasure Hunt	These physical games inspire the team because the players have unlimited freedom of movement, which is something the team is aiming to achieve with the tech the team are using.
6	Kinect/Wii Games	The games on these systems are also an inspiration for the team, as they have similar results that the team wants to achieve for their capstone: creating a digital game that allows freedom of movement.

8. IMPORTANT DOCUMENTS

8.1. TECH DESIGN DOCUMENT

- Technical Design Document

8.2. PLAYTESTING DOCUMENTS

- Character Design Test 1 Results (Excel)
- Materials Playtesting Results (Google Form)
- Character Design Test 2 Results (Google Form)
- Testing Document Nov 27 2018

Appendix B: Technical Design Document

The technical design document was made by the technical designers to **track the research and data** they collected while using and working with **all the technology** we had. It includes their documentation for the Windows Mixed Reality headset, Leap Motion, Zed M camera, and the HP VR Backpack.

Technical Design Document

Hexabyte!

Overview

Our project utilizes multiple technology platforms including the Windows Mixed Reality Headset, ZED Mini Stereo Camera, HP Backpack Workstation, and Leap Motion. The goal of the project is to be able to combine these technologies into a cohesive experience that allows the player to freely explore a virtual space in the real world, interacting with the game using their own hands and physical position in space.

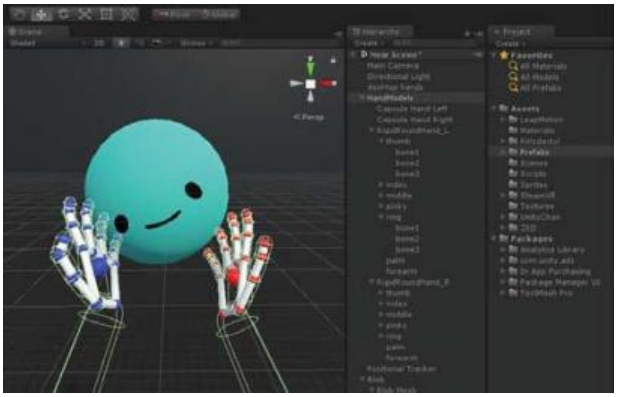
Using the HP Backpack Workstation we are able to allow users to move freely while wearing the Windows Mixed Reality Headset, overcoming the challenge of having the user tethered to their computer and presenting them with the ability to move freely through the experience.

The ZEDm Camera allows us to let users see the world outside of the headset, turning the headset from a separate world into a bridge between the virtual world and ours. With Leap Motion we can make this bridge all the more real by allowing users to use their own hands as controllers to interface the new mixed reality world.

Player Interaction

The systems that enable interaction between the player and the game mainly utilizes the Leap Motion tech and its advanced hand tracking capabilities. By using Leap Motion, the player is able to use their bare hands as the controller. This allows them to interact with objects within the game and perform several interactions.

The main interactions currently being utilized is the grabbing and the pushing. The pushing interaction mostly relies on the hand tracking. It determines if the hand has collided with an object, and applies the appropriate force depending on the velocity of the hand currently tracked. On the other hand, the grabbing interaction utilizes the Interaction Manager system provided within Leap Motion.



Hardware List

- HP Omen X Backpack Compact Computer
- HP Windows Mixed Reality Headset
- ZED Mini Sterio Camera
- Leap Motion 3D Motion Controller
- Microsoft Wireless Display Adapter
- Mini Display Port Emulator
- Logitech Wireless Touch Keyboard K400 Plus

Development Setup

Tech Setup

Windows Mixed Reality Headset

- Plug in Windows Mixed Reality Headset
- Windows Mixed Reality Portal should open automatically once headset is plugged in
- Follow setup instructions, choosing to set up for all experiences with a boundary
- Wear headset and follow on screen instructions

ZEDm Camera

- Download and install ZED SDK for Windows (2.7 as of 1/22/2019)
- Plug ZEDm Camera into computer
- Run ZED Diagnostic Program, updating graphics drivers as needed
- Run ZED Calibration Program

Leap Motion

- Plug in Leap Motion
- Download and install Leap Orion SDK beta (sign in to account is necessary)

SteamVR

- Download and install Steam
- Launch Steam and create or sign in to an account
- Download Windows Mixed Reality for SteamVR
- Launch SteamVR using the button at the top right of the Steam application labeled VR

Unity Setup

ZEDm Camera

- Download ZED Plugin for Unity (2.7 as of 1/22/2019)
- Import ZED Plugin into Unity

Leap Motion

- Download Leap Motion Unity Core Assets
- Import Core Assets into Unity
- Download Leap Motion Interaction Engine Module
- Import Interaction Engine Module into Unity

SteamVR / Windows Mixed Reality Headset

- Download SteamVR Unity Plugin v1.2.3
- Import SteamVR Plugin into Unity
- Enable Virtual Reality under XR Settings in Player Settings

Setup Troubleshooting

Older version of steam VR is used because of compatibility issues between ZED Camera and SteamVR. This may be fixed in newer versions.

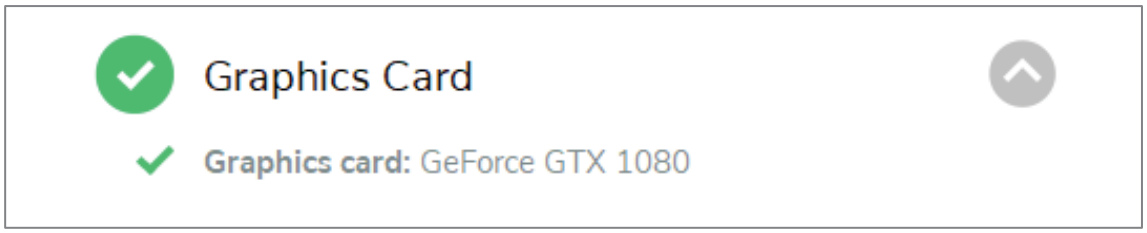
While installing ZED SDK Nvidia CUDA may fail to install and may have to be installed manually.

If you have multiple versions of Nvidia CUDA the ZEDm Camera will not work, so make sure to remove any existing versions before installing a new one.

If the ZED Diagnostic Camera Test fails, try unplugging the camera and plugging it back in again. Make sure that the USB-C connected to the camera itself has the arrows facing outwards, in the same direction as the camera.

The ZED Diagnostic Graphics Card test may return a warning if your graphics card is not of the correct type, however this can be ignored if your graphics card is powerful enough. (Quadro vs GTX)

While setting up the Windows Mixed Reality headset you may be prompted to continue using controllers, however if your device does not have Bluetooth you will have to continue with a mouse as the controllers will be unable to connect.



Game Setup

Before starting up the game, there are several steps required:

1. Make sure all the necessary hardware are connected to the HP Omen X Backpack computer. These include the HP Windows Mixed Reality headset, ZED Mini Stereo

Camera, Leap Motion 3D Motion Controller, and the Logitech Wireless Touch Keyboard K400 Plus.
2. Connect the Microsoft Wireless Display Adapter to the secondary display. Switch to the appropriate input and the secondary display should show the Microsoft logo or "MSDisplayAdapter_CA" (name of the connection) and "Ready to connect".
3. Connect the HP Backpack computer by clicking "Connect" under the Actions Centre or by pressing ⊞ + K. Select MSDisplayAdapter_CA.
4. Open the Windows Mixed Reality Portal application.
5. Open Steam and run Steam VR by clicking on the button located on the top right corner.
6. Check that both applications indicate "Ready". This means all the necessary equipment are properly connected and ready for use.
7. Open the project build.
8. Calibrate the Leap Motion hands with the arrow keys (shift + up/down arrow key for z axis)
9. Undock the backpack computer and attach it to the harness. The harness should make a clicking sound indicating the backpack computer is properly secured.
10. Immediately connect the batteries to the backpack computer. Everything is ready for use.

Troubleshooting

Common Issues

The headset does not display anything

The most common reason for this is that there is no other display connected to the computer. For the HP Mixed Reality Headset to function a second display must be connected to the computer.

There are multiple ways to do this, the first is by plugging a Mini Display Port Emulator into the backpack. The emulator acts as a second display and so the headset will function normally, however this may cause issues with connecting the backpack to a proper display. It is recommended that you remove the Mini Display Port Emulator when not using it to avoid this.

The second method is to connect the backpack to a Microsoft Wireless Display Adapter. The wireless display acts the same way that a traditional display does and has an advantage over using a Mini Display Port Emulator in that it allows access to the HP Omen X Backpack without needing to dock it.

If a second display is connected to the computer and the headset still does not display anything there may be an issue with the headset's connection and the Windows Mixed Reality Portal. If there is an issue with the headset's connection the Windows Mixed Reality Portal will display an error, either saying that there was an issue with the headset's connection or that "Something went wrong". If there is an issue with the headsets connection, simply unplug the headset and plug it in again. If this does not work or instead "Something went wrong" is displayed by the Windows Mixed Reality Portal a full restart of the computer may be required.

Sudden Frame Rate Drop

While issues with frame rate may be due to the performance of the game itself, it is also possible that this is due to the backpack not having a stable power supply. While undocked the HP Omen X Backpack need to be connected to two external batteries to achieve the same performance as when docked. As these batteries start to drain the performance of the HP Omen X Backpack will begin to decrease. In order to maintain optimal performance it is recommended that batteries be replaced before draining halfway. While swapping out batteries there may be a drop in performance, but this is temporary and should go back to normal once a charged battery is reconnected. If the HP Omen X is ever running off of its internal battery or is not connected to a sufficient power source the normally red logo on the front will turn yellow and flash.

Leap Motion Detection Loss

There are some instances where the leap motion hand tracking will get lost despite the fact that the hands are in proper range. This is a problem we discovered due to how we are securing the Leap Motion sensor to the headset. Initially, we were using rubber bands and this caused some issues where the rubber bands would cover a small portion of the sensor.

We tried to remedy this problem by attaching the sensor to the headset through velcro stickers. But during some of our playtests, we found out that the velcro isn't secure enough and the sensor would fall off occasionally. As a result, we ended up reverting to the rubber bands in addition to the velcro.

Another reason for losing the detection was due to the angle of the leap motion relative to the ZED mini camera. The camera tends to angle upwards and the user's hands end up exiting the leap motion's detection range.

The last one to keep in mind of is the smudging of the sensor. When this occurs, the computer will notify you through a pop up in the secondary display. Although it is good practice to always keep the sensor clean to prevent any detection problems

Previous Issues

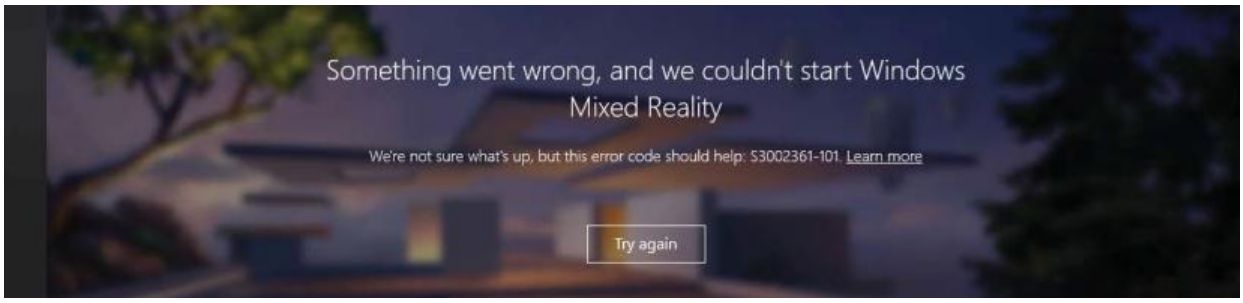
Windows Mixed Reality Crashes

During several playtest sessions, the Windows Mixed Reality portal would crash. It would display an error message saying "Something went wrong, and we couldn't start Windows Mixed Reality." Below the message, it will also display an error code. Previously we had experienced 2 error codes:

S3002361-101. This crash occurs during runtime and could be fixed by closing and reopening the portal. This was most likely caused the HP Mixed Reality Headset going to sleep.

S0002361-101. This crash occurs during startup, and its cause is unknown. The only way to fix this crash is to reinstall the Windows Mixed Reality Portal, which requires an internet connection.

Below is a screenshot of what it looked like when the Windows Mixed Reality Portal would throw an error.



Fix for Windows Mixed Reality Crashes

These error codes were fixed by updating Windows 10 from version 1803 to version 1809. This would prevent any "S" designated error codes.

After updating Windows 10, we decided to start troubleshooting the build and see if we would still get either error codes. Troubleshooting mainly involved running the build several times but under different conditions. These conditions include:

- 1st time setup. Launching Steam VR, Windows Mixed Reality Portal, and the build for the first time.
- Reopening only the build.
- Restarting the PC and then doing 1st time setup.

After running the build with a total number of **75** times under these conditions, we experienced **0** Windows Mixed Reality Portal crash.

Upon further testing we found that the Windows Mixed Reality Portal would still occasionally crash, however we estimate that this was caused by overheating due to boost mode as once we disabled boost mode we did not experience any further random crashes.

Headset Positional Tracking

There will be instances where the player runs the game and the headset tracking will be inactive. This results in the players movements in the real world not being tracked by the game. Because of the ZEDm camera still functioning this makes it look like any virtual objects are moving with the player. This doesn't always happen however and sometimes the game will function as normal.

We contacted Stereolabs support and went back and forth troubleshooting the issue. We managed to narrow down a few reasons why this might be happening.

- Steam VR disconnecting or failing to initialize properly.
- ZED SDK failing to initialize.
- Windows Mixed Reality portal crashing.

Fix for Headset Positional Tracking

Issues with positional tracking came about when switching from using the ZEDm's positional tracking to using the HP Mixed Reality Headset's positional tracking. This was done to prevent issues with the ZEDm's spatial tracking, however the positional tracking issues started occuring because of this change.

To fix this we reverted to using the ZEDm's positional tracking and instead worked with Stereolabs, the developers of the ZEDm camera, to solve the issue with the ZEDm's spatial tracking. The results of our troubleshooting were inconclusive, but the issue was solved by moving from the HP Z VR Backpack to the HP Omen X Backpack. There could be any number of differences between the two backpacks that was causing this issue, but the biggest difference is their graphics cards. The HP Z VR Backpack has a Quadro P5200 graphics card where the HP Omen X Backpack has a GTX 1080 graphics card, which the ZEDm was developed with in mind.

Latency Issues and Disconnecting from the Microsoft Wireless Display Adapter

Previously there were issues with the Microsoft Wireless Display Adapter. It would perform quite poorly, with frequent interruptions and video artefacts. It would also disconnect from the computer after a few minutes.

This was thought to be due to the Microsoft Wireless Display Adapter overheating, as it would become quite hot after only a few minutes. However, it turns out that it wasn't the adapter that was overheating, but rather the computer itself. While running the game the computer would use 100% of its power, which would cause it to go into boost mode to help with performance. Being in boost mode would cause the computer to quickly overheat, and this would interfere with the connection with the Microsoft Wireless Adapter. To prevent this, we capped the computer's performance at 99% percent of its power, preventing it from going into boost mode as outlined here: https://www.tautvidas.com/blog/2011/04/disabling-intel-turbo-boost/.

Appendix C: Art Guide

This guide was made by the artists to **decide, check, and design the art style** for the project. It includes guides on art, models, textures and overall aesthetics.

Art Guide

Project Summary

Booyo Park is a Mixed Reality (MR) experience, made in collaboration with Shadow Factory (Hong Kong) and sponsored by HP Canada. Booyos are creatures that live on a separate realm above our own world. By wearing special gear, players can walk around and see these cute Booyos. They can even poke, pick up, and merge them using their hands! These interactions are made possible by utilizing:

- the freedom of movement from HP's VR backpacks,
- the VR technology of HP's MR headsets,
- the depth perception of the ZEDm camera, and
- the hand tracking technology of the Leap Motion.

Limitations

Because minimal lag is very important in VR, the art team's main goal is to provide **simple, optimized assets**. Additionally, the art team also aims for a **simplistic style** to complement their expertise.

For *Booyo Park*, there will be **only one character**, the Booyo. There will be different variations of the Booyo depending on the player's location, but these variations will be limited to **colors and accessories**.

Figure 1. Moodboard of the project. Note the low-poly style and the colorful color palette.

Art Style

Characters

Characters will be **simplistic**. They will have as few details and joints as possible.

The characters will also have **cutesy proportions**: large heads, tiny limbs, and simple facial expressions.

Figure 2. Character reference. Note the proportions and the simplistic details. Meshtint Studio. Sparkle Series Flora*. 2018. Digital image.*

Items & Accessories

Like the characters, all items will be **simplistic** and **blocky**, with slightly beveled edges to avoid the faceted look of many low-poly models.

Environment

Because *Booyo Park* uses the real world as its environment, there will be **few to no environment assets**. However, if the game design may be updated to include interactable virtual environment props.

Color Palette

The game will use a **soft and bright palette** reminiscent of *Ooblets* and *Keep Talking and Nobody Explodes.*

Art Assets

Models

The models will have a **basic, cartoon-y look** overall. The models would be relatively **low poly** to help optimize the game for MR. As much as possible, we will use **Unity's default shapes** to bypass the need for importing.

We want to purposely avoid the faceted look that many low-poly models have, so we want to strike a balance of smoother models while also avoiding a high poly count overall.

Textures

For the textures of the models, we have decided to use **flat colours** and **no shading**. The shadows will be done in-engine, so that the programmers can easily control the lighting and depth perception UX design.

The textures will be simple. At most, we will add gradients and some patterns to add visual interest, similar to *Ooblets*, but overall the textures will remain as simple as possible.

Figure 3. Reference for model textures. Note the flat colors (the shadows seem to be from the rendering, but not the texture). Thousand Stars Studio. 2018. Digital image.

References

Chamizo, R. (Game artist). (2015). *Lowpoly Town House*. [Digital image]. Retrieved from https://ricardochamizo.artstation.com/projects/6vaWV?album_id=101678

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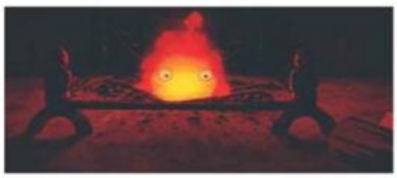
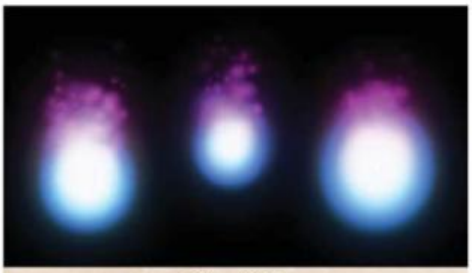
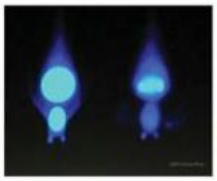
Appendix D: Production Documents & Diagrams

These are various documents and diagrams **used internally** to **explain and illustrate ideas** to other team members.





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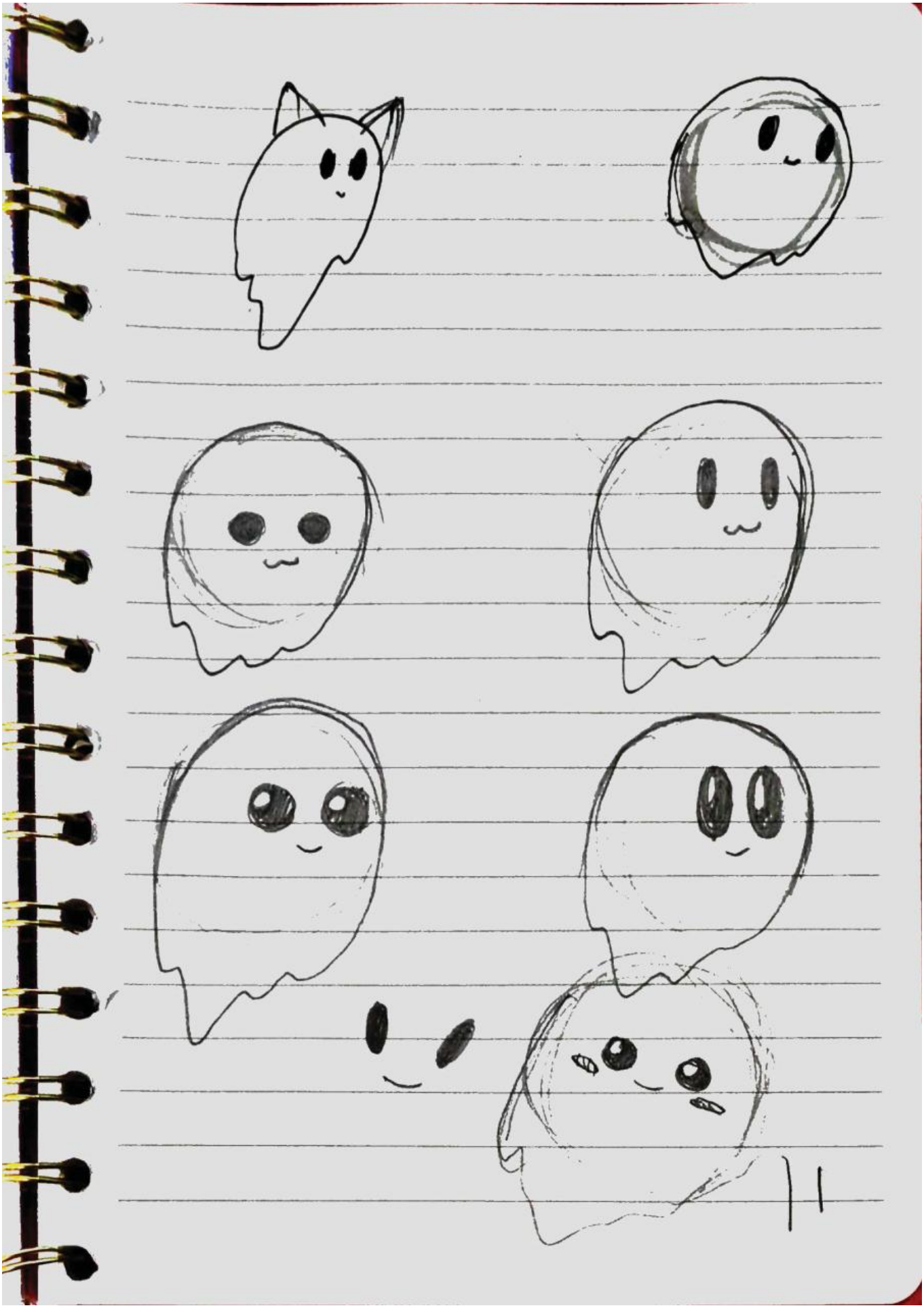
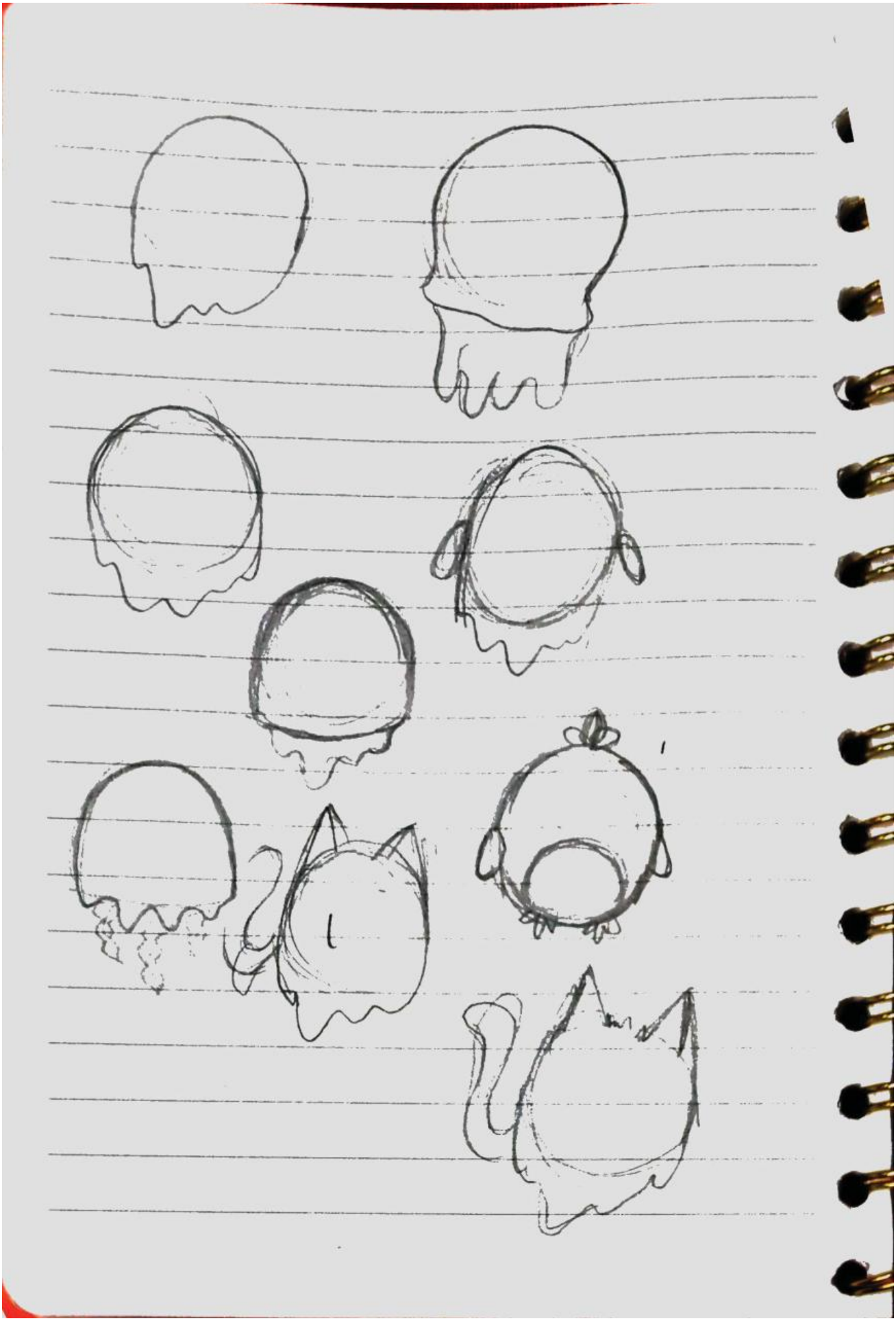
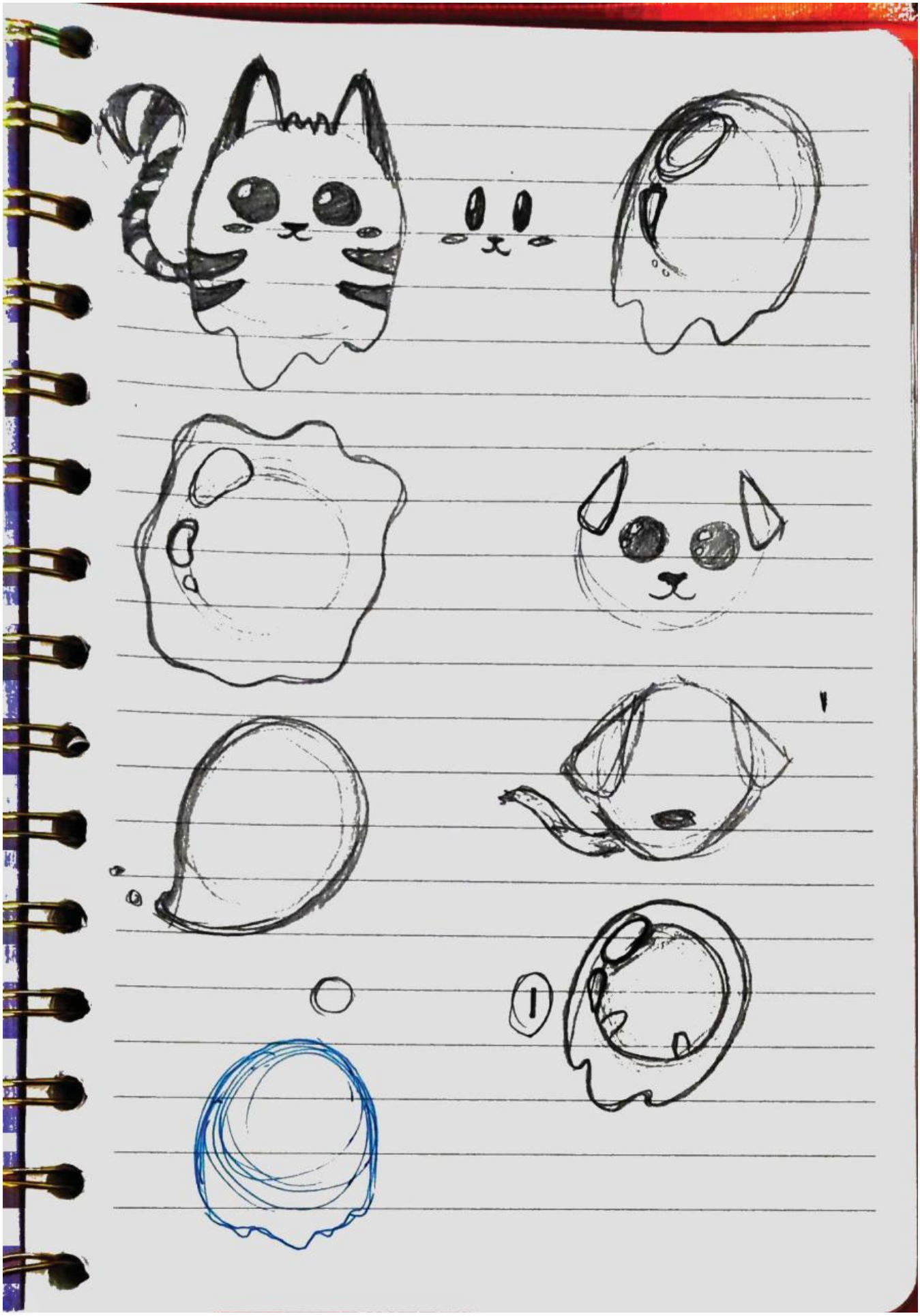
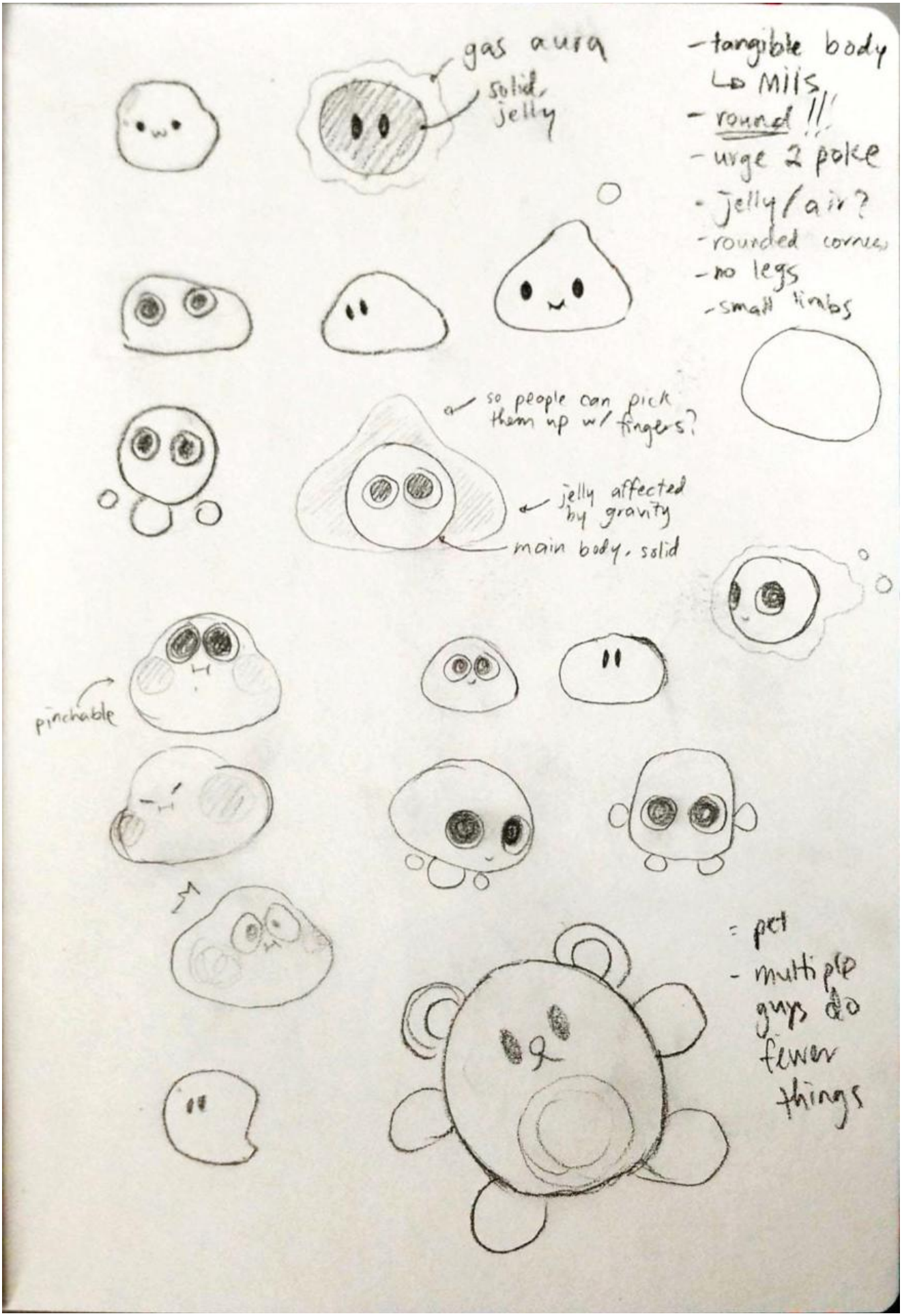
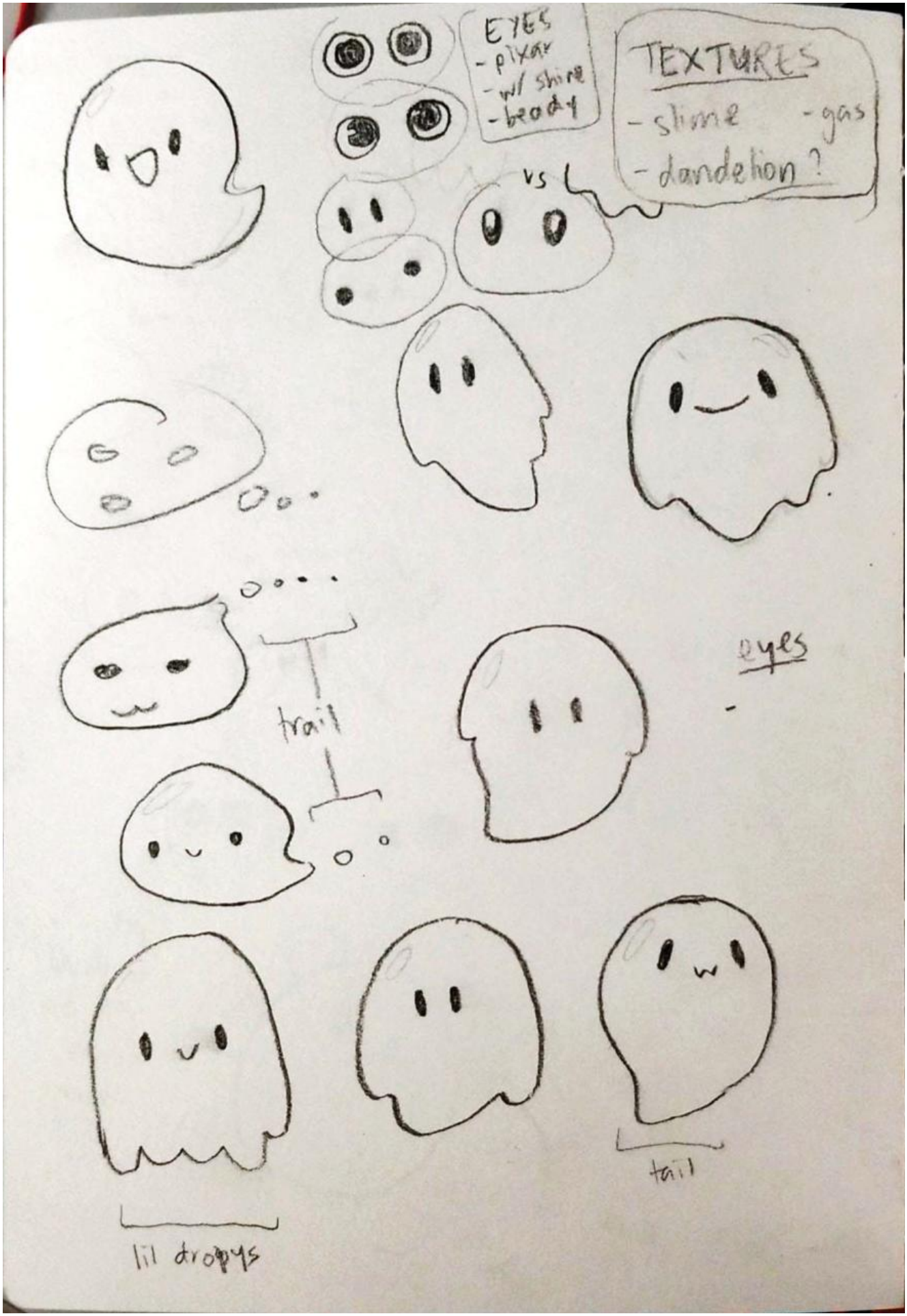
Slime Rancher
Official Launch Trailer








gas aura
solid, jelly
- tangible body
↳ MILS
- round !!
- urge 2 poke
- jelly / air?
- rounded corners
- no legs
- small limbs
so people can pick them up w/ fingers?
jelly affected by gravity
main body, solid
pinchable
= pet
- multiple guys do fewer things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TEXTURES
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- gas
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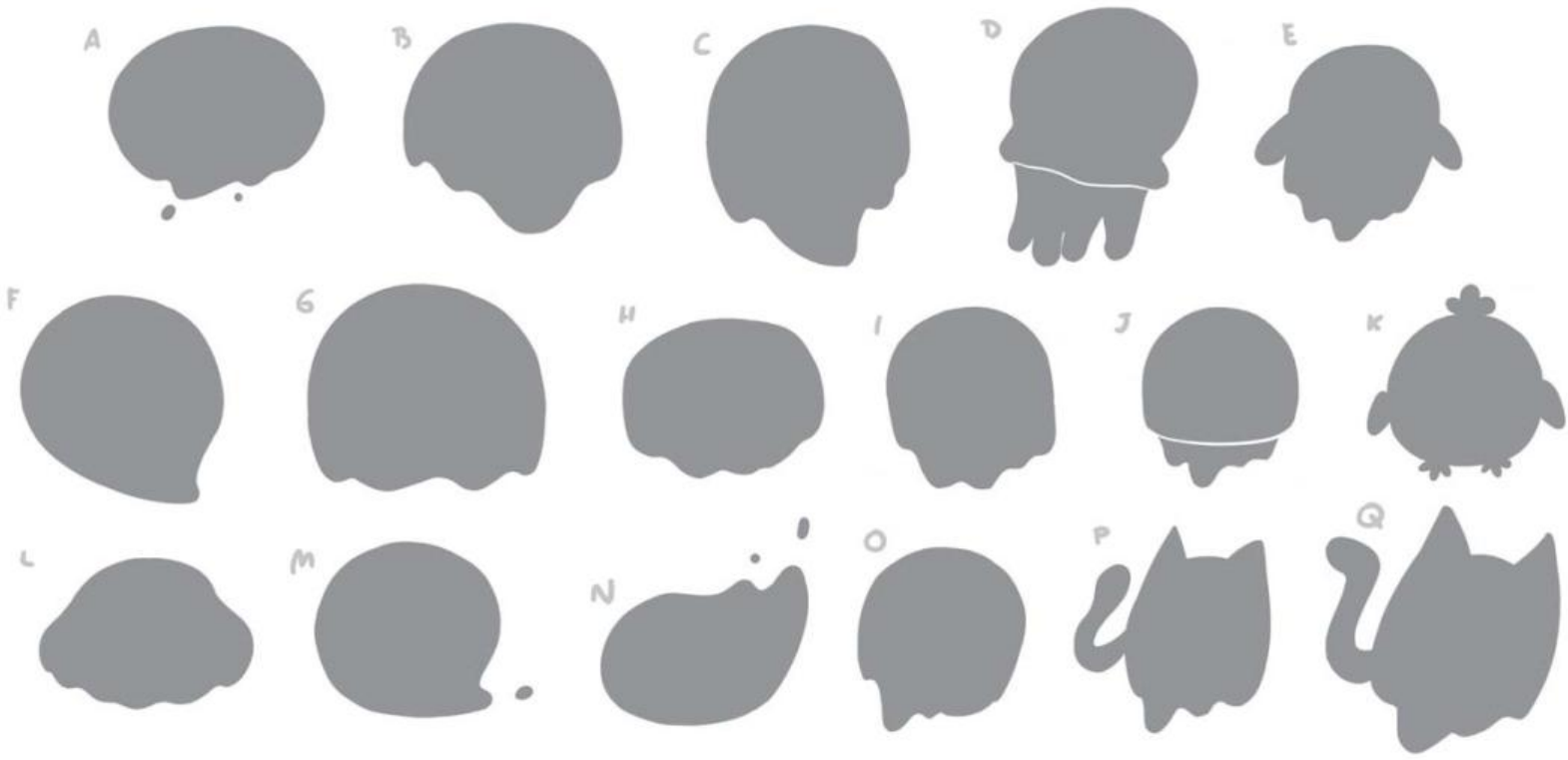
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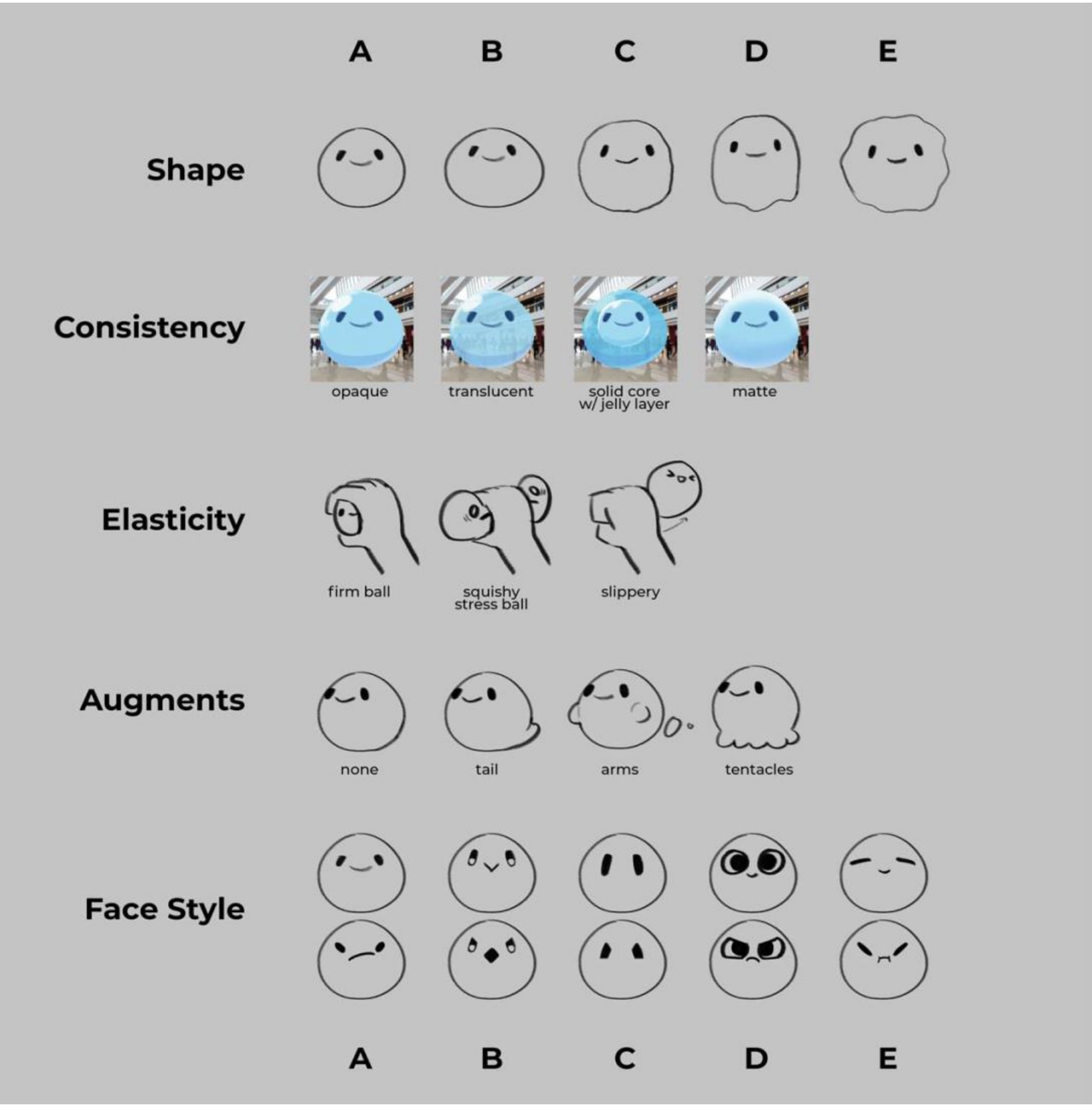
Poporing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Shape
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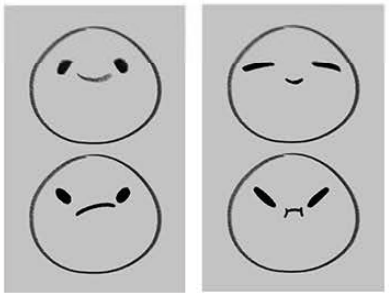

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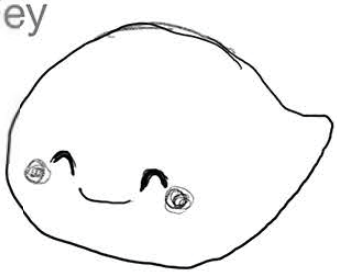


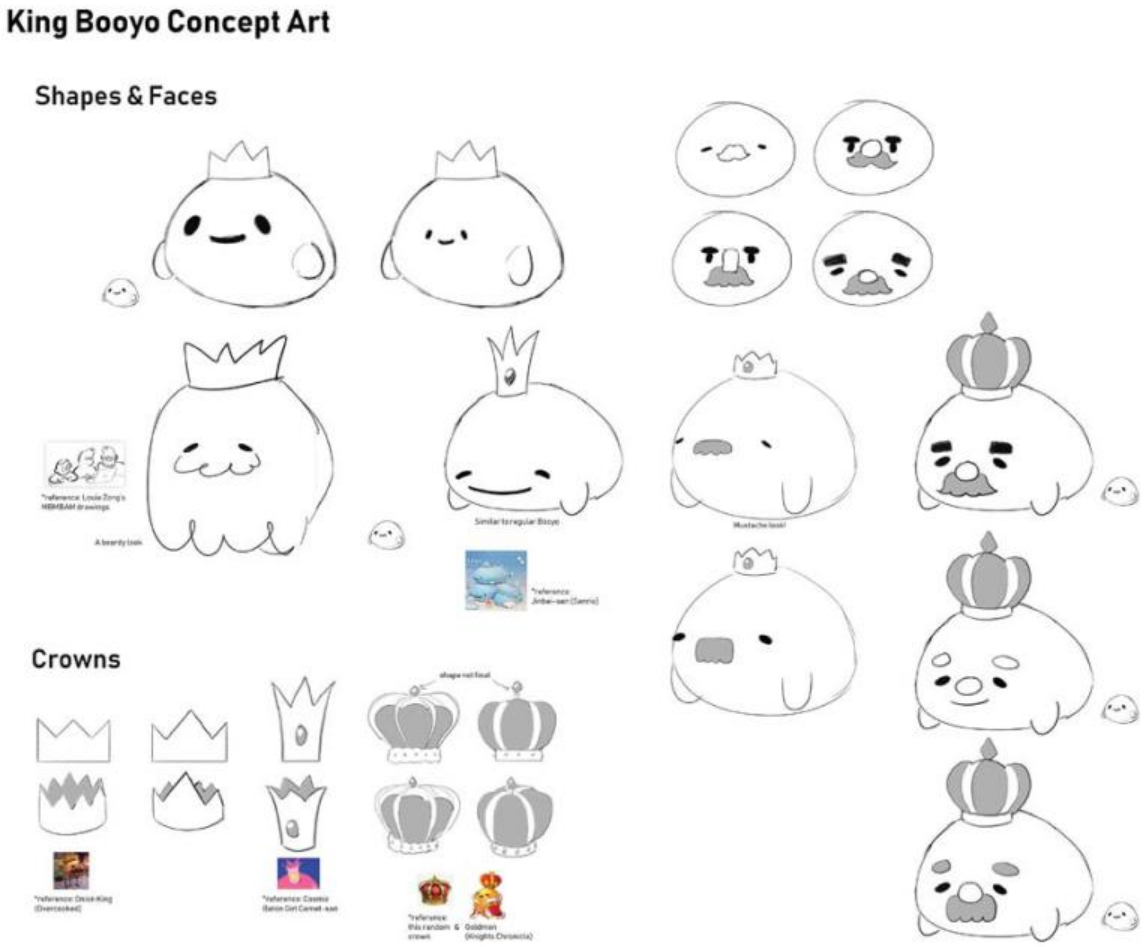
Splitting Blobs

Quick smear?


RW&CO.
ICE CREAM

Possible Narrative

At one point in development, we experimented in including a narrative for the overall experience. King Booyo was created and he was meant to task the players with taking care of his children. This feature was later cut due to time constraints.



Blob Emote Mockup - Idle

Movement
- Blobs move slowly forward while following a wave pattern.
Face tilts to match wave pattern

Ideal

Idle 1

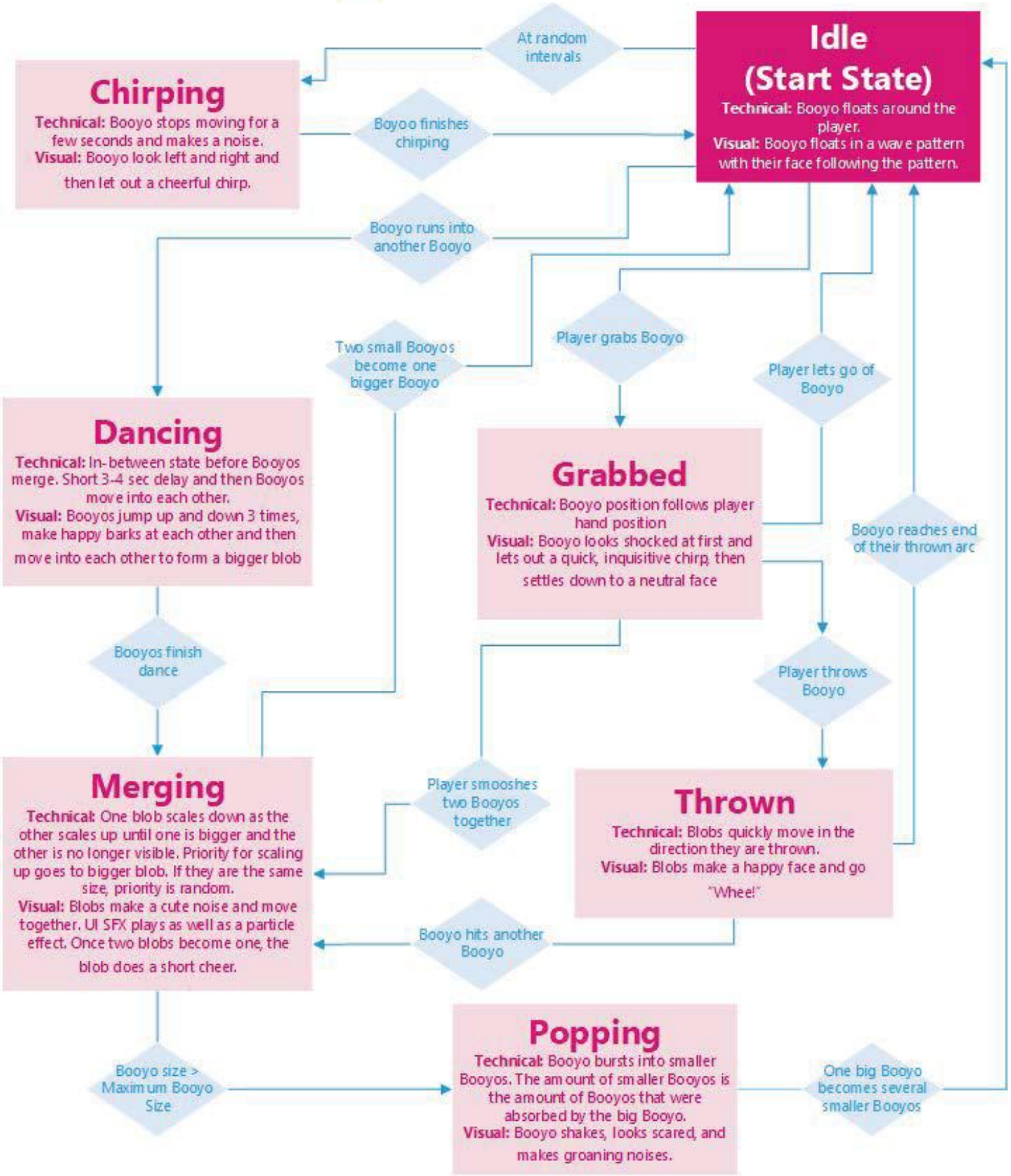
- Will stop and look around
- let out a quick chirp

Idle 2 maybe?

Blob stops, sneezes, shakes face and continues floating

Optional

Booyos AI State Chart



Booyo Park

State Animatic

HEXA BYTE!

Idle

HEXA BYTE!

Booyo Park - Idle state Animatic

HEXA BYTE!

Booyo Park - Idle state Animatic

HEXA BYTE!

Booyo Park - Idle state Animatic

HEXA BYTE!

Booyo Park - Idle state Animatic

HEXA BYTE!

Booyo Park - Idle state Animatic

Booyos slowly move in a wave pattern with their face following (going up, looking up.)

7

Dancing

HEXA BYTE!

4

Booyo Park - Dancing state Animatic

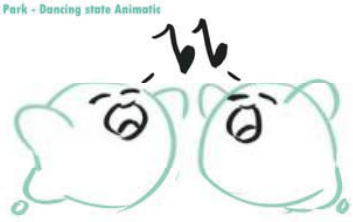
Two Booyos bump into each other (can only happen through idling)

9

Booyo Park - Dancing state Animatic

10

Booyo Park - Dancing state Animatic

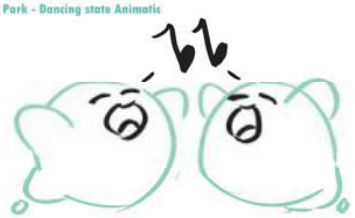


11

Booyo Park - Dancing state Animatic

12

Booya Park - Dancing state Animatic

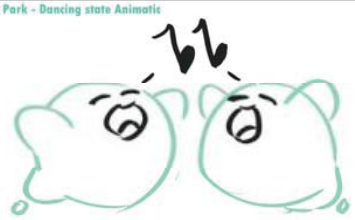


13

Booya Park - Dancing state Animatic

14

Booya Park - Dancing state Animatic



The two Booyos do a quick dance where they bounce three times, letting out a cute noise everytime they bounce up

15

Merging

From Dancing

16

Booya Park - Merging state Animatic

17

Booya Park - Merging state Animatic

Two Booyos slowly get closer to each other, eyes closed

18

Booyo Park - Merging state Animatic

Very quickly, one Booyo will get bigger while another gets smaller

19

Booyo Park - Merging state Animatic

Once one Booyo has shrunken to the point of no longer being visible, the big Booyo will let out a short cheer and return to idling

20

Merging

From Throwing/Player mushing two together

21

Booyo Park - Merging state Animatic

22

Booyo Park - Merging state Animatic

Both Booyos make a squishy face while the Raymarching attempts to solidifying into one

23

Booyo Park - Merging state Animatic

Once merging is done, the big Booyo will make a surprised face before going back to idling

24

Booyo Park - Merging state Animatic

Any Booyos that have absorbed any number of other Booyos, they have chubby cheeks

25

Popping

26

Booyo Park - Popping state Animatic

Only happens when Booyos reach maximum size

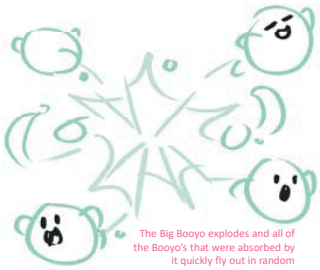
27

Booyo Park - Popping state Animatic

The Booyo will start to shake and look scared before popping

28

Booyo Park - Popping state Animatic

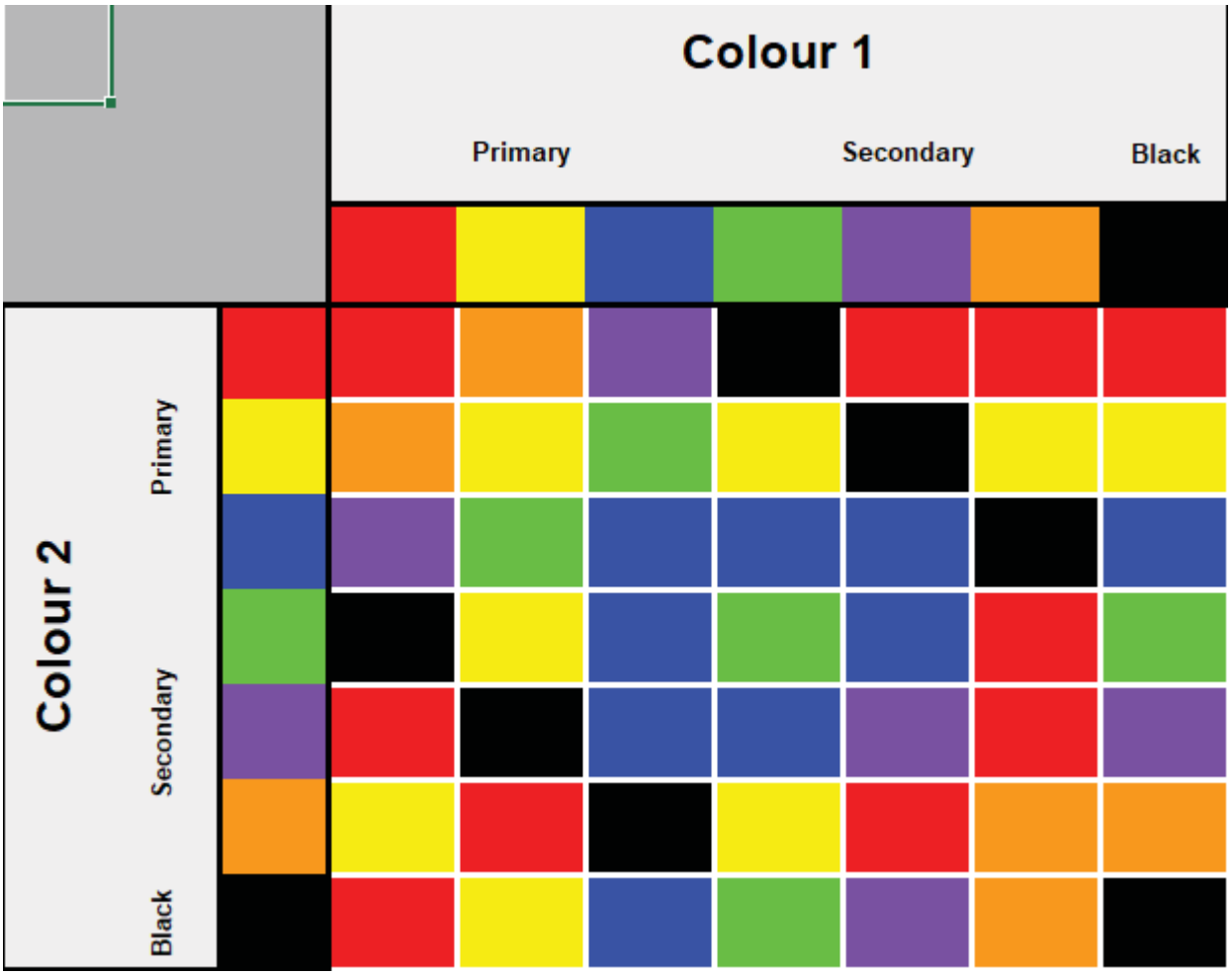


The Big Booyo explodes and all of the Booyo's that were absorbed by it quickly fly out in random directions

29

New mechanic

Part way through development, our team came up with a colour changing mechanic. Different Booyos of different colours can turn into new colours when merged. This was the most fleshed out mechanic we had come up with that was eventually cut to do time constraints. Below is a table outlining what colour would result based on the merged Booyos.



Booyo Park Audio Asset List					
Category	Sound Needed	Description of sound	Variations Needed	Loop	Reference Material
Music	Ambient Music	Chill vibe ambient music that plays during gameplay. Low tempo and mezzo piano tunes that don't demand a lot of attention but fill the world with soothing noises. Has a bit of a swing to it. Strings, percussions, piano	1	Yes	Animal Crossing New Leaf : 11 AM https://www.youtube.com/watch?v=1ZXwbqjoHQ8&list=PLoIp-AJdIshrDMcjzq55yHiKazadGxPn3&index=12
UI	Merging Blob	Quick plopping noise with a gamey jingle when two blobs get merged together	2	No	Plop noise: https://drive.google.com/file/d/1E2Z4_G6j9s1HbEfxvj4O6lAGvl1yYcER/view?usp=sharing Jingle: https://drive.google.com/file/d/1b1eiSO1ObCjq7FdW-uU77RU3NRW19cpH/view?usp=sharing
Characters	Blob Happy	A high-pitched, wet sounding giggle. Should not sound intimidating or gross, but should be adorable. Think Inkling noises from Splatoon	4	No	https://www.youtube.com/watch?v=cEAUYysg5FY
Characters	Blob Sad	High-pitched wimpering and sniffing. Has a wet-sounding disortion to it	4	No	https://www.youtube.com/watch?v=cEAUYysg5FY
Characters	Blob Angry	High-pitched, wet gurgley sounding growling. Shouldn't be intimidating but give off the idea the creature is mad.	4	No	https://www.youtube.com/watch?v=cEAUYysg5FY
Characters	Blob Surprised	Quick shocked chirp made by blobs when players pick them up. Not explicity scared but more panicked than Blob Chirps	7	No	https://www.youtube.com/watch?v=cEAUYysg5FY
Characters	Blob Wincing	Strained, high-pitched groaning as if the blob's trying to push something. Plays when players try to force two blobs to merge	2	No	https://www.youtube.com/watch?v=cEAUYysg5FY
Characters	Blob Chirps	Quick high-pitched chirps blobs randomly make when they are wandering around.	7	No	https://www.youtube.com/watch?v=cEAUYysg5FY
Foley	Wobble	Low frequencey wobble that pitches upward when player grabs/pokes the blob	4	No	Sound when you place move furniture from your inventory into your house in Animal Crossing
Foley	Woosh	Soft whistle noise as the blob gets thrown by the player	3	No	Pokemon GO pokeball throwing
Foley	Blobs Moving	very low subtle humming noises, like a spaceship floating around.	2	Yes	https://drive.google.com/file/d/1bbNipSRzH1JeVowQ8K-hq_H3J5B8slom/view?usp=sharing But like even more subtle and less menacing sounding

Booyo Park

Stage	Music Track	Gameplay Focus
1-People spot the set-up	Background ambience and booyo sounds heard through speakers	n/a
2-People wait in line to try Booyo Park	Background ambience and booyo sounds heard through speakers Sound effects and music coming from educational Booyo video	n/a
3- Getting the player into the backpack and headset	Background ambience and booyo sounds heard through speakers	Marks the start of the experience
4-Playing with Booyos	Background Ambience and booyo sounds heard through the headphones	Players interact with the creatures
5- Offboarding	Background Ambience and booyo sounds heard through the headphones	Marks the end of the experience

Feature Mechanics	Required Assets	Required Mechanics	Mechanics introduced
n/a	n/a	n/a	n/a
n/a	Booyo educational video	n/a	n/a
n/a	Textured hands	n/a	n/a
Merging Booyos together Grabbing Booyos Tossing Booyos around Touching Booyos	Numerous Blobs Textured hands	Merging Booyos Grabbing Booyos Tossing Booyos around Touching Booyos	Merging Booyos Grabbing Booyos Tossing Booyos around Touching Booyos
n/a	Booyos on sticks Snap lens "Instagramable" moments	n/a	n/a

Story Events for the Level	Estimated Time
Teams interacts with any interested passerbys and talks to them about the tech, game, and the booyos and then are asked if they'd like to play	1-2 minutes
Video talks about Booyos in a fun educational video	2-10 minutes (depends on the wait)
Players are geared up and ready to play	20-30 seconds
Player plays with the booyos	2 minutes (more if there's no wait)
Player is told their time is up, and are given the opportunity to take photos as souvenirs to remember the experience	30 seconds

Welcome to Booyo Park!

These are Booyos! Round Squishy creatures that chirp and float around!

Booyos are completely invisible to the naked eye.

You can't see them without this cool backpack!

You can play with them using your hands: pick them up, throw them around, or merge them together!

Make them bigger...

...and bigger!

But watch out!

They like to pop! Combine as many as you can and watch the number go up!

Booyos are adorable and very social. They love to play with humans!

Did we mention they're very,

...very,

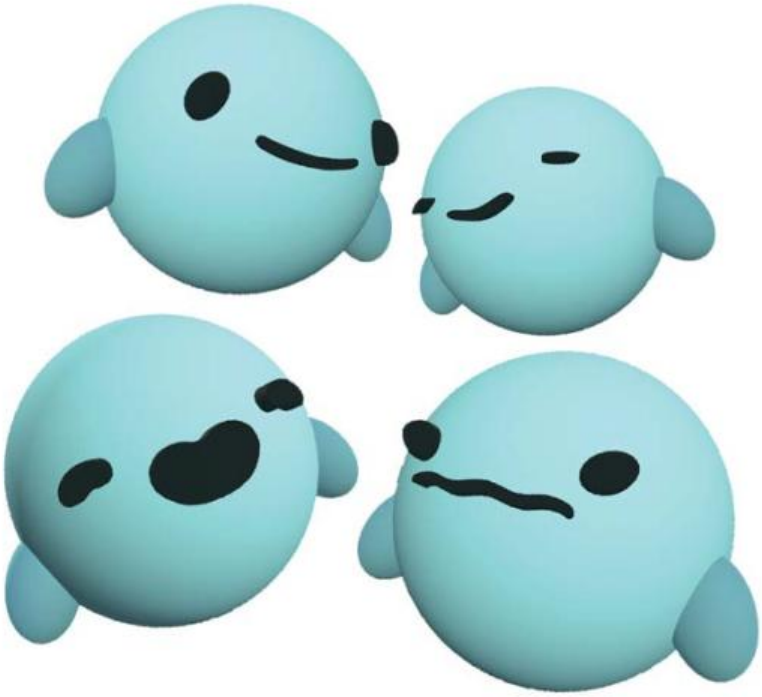
...very cute?

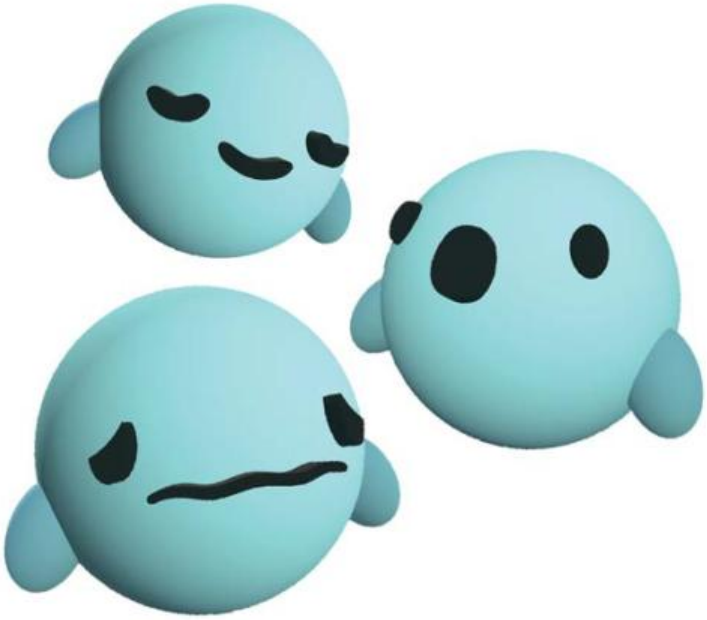
[cute Booyo sound]

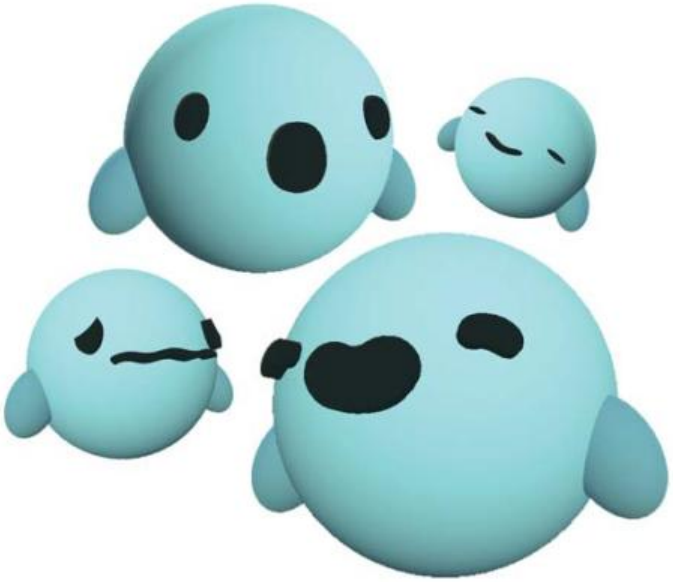
Play with them in Booyo Park!

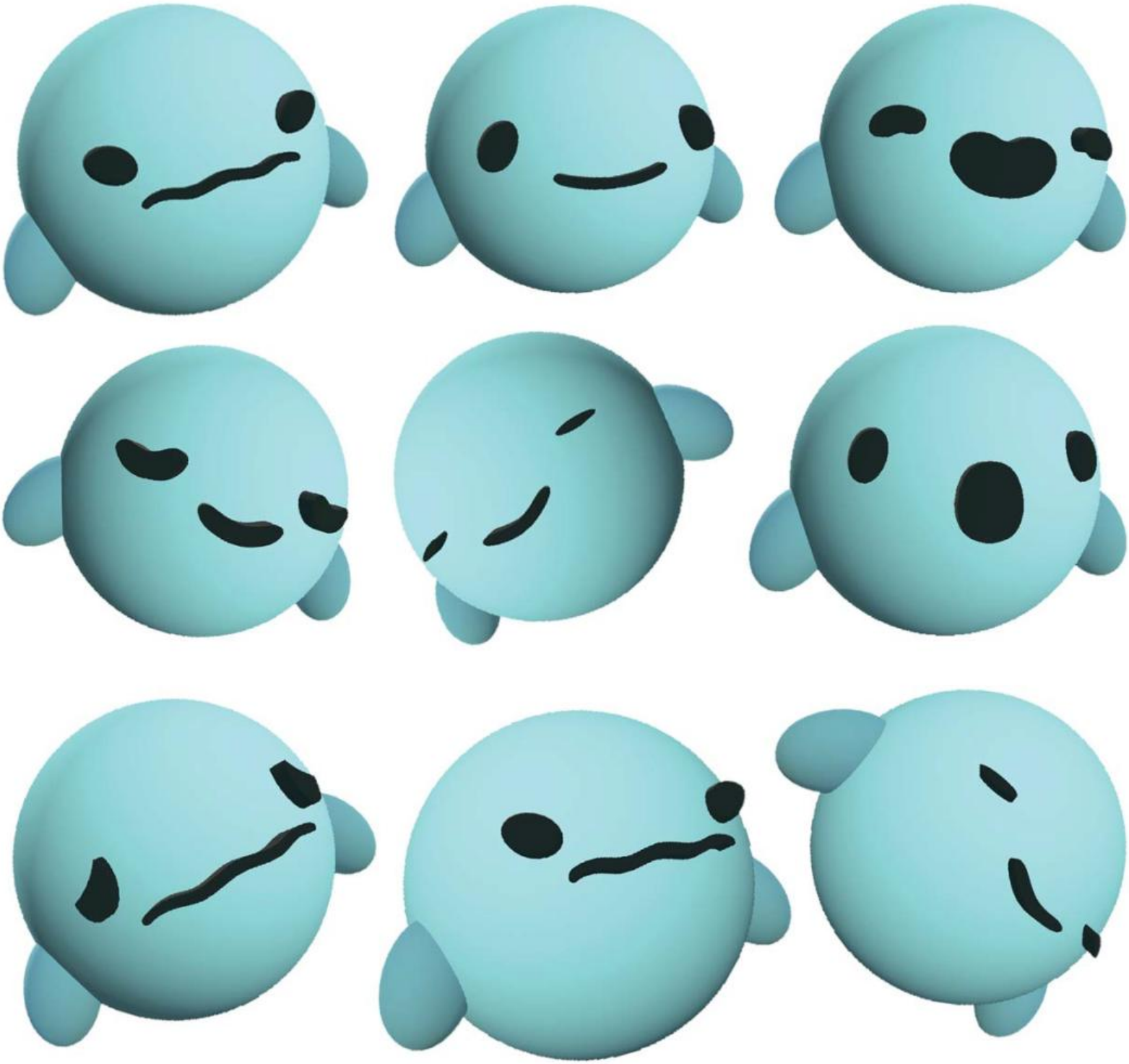
They're eager to meet you!

Onboarding Video Storyboard Oakville Library Playtest version









Appendix E: Team Charter

This document was made to **fully outline the project's objectives, outcomes, deliverables, organizations, and risks** so we could get **approval** of the project from our program and faculty.

Sheridan

Faculty of Animation, Arts and Design

Project Charter

Booyo Park

Hexabyte!

Honours Bachelor of Game Design
Capstone Year
2018-2019

Document Purpose

A project charter is a document approved by the program that formally approves the game project, and provides the project team with the direction to apply resources to the project activities.[1]

The purpose of the charter is to obtain formal approval on the general parameters and structure of the proposed project, including:

- the project objectives and outcomes, benefits, scope, and risks;
- the project deliverables, schedule, milestones, and estimated resources; and
- the project organization, governance structure, and stakeholders.

[1] This Project Charter document template is based on the Treasury Board Project Charter Template.

Table of Contents

Section 1. Charter Introduction

1.1 Document Change Control

Revision Number	Date of Issue	Author(s)	Brief Description of Change
1.0	9/10/2018	Keana	Changed file format from .doc to .docx.
1.1	9/11/2018	Yani	Filling in more info.
1.2	9/14/2018	Keana	Trying to fix signatures.
1.3	9/14/2018	Keana, Justin, Jen	Editing.
1.4	9/17/2018	Keana, James, Justin, Michael, Jen	Finishing up the first draft of the document, adding info under milestones, boundaries, and scope.
1.5	9/18/2018	Keana, Justin, Michael, Jen, James	Finishing up details and rewriting sections based on feedback.
1.6	9/18/2018	Yani	Changed formatting of document, removed old information, updated the table of contents.
1.7	9/19/2018	Keana	Updated team name, added new milestone.
1.8	9/25/2018	Keana, James, Justin, Michael, Jen	Updated document based on feedback. Updated milestones, risks, governance chart. Added pillars and persona.
1.9	9/26/2018	Keana	Removed comments.
2.0	9/27/2018	Jen	Edited Executive Summary and Key References to emphasize Shadow Factory's design challenge
		Keana	Added signatures and dates of all team members. Made font styles and sizes consistent, and fixed the formatting.

1.2 Executive Summary

This project was started to fulfill the requirements of Sheridan College's 4th year Bachelor of Game Design capstone project. The goal of this project is to develop a unique and interesting experience utilizing new portable equipment technologies. The team will be following a challenge given by **Shadow Factory** to create a fun and interesting location-based experience that utilizes tech allowing players to move around freely without the restriction of cables. The final deliverable of the project will be a prototype for a mixed reality game that takes full advantage of portable, cordless, virtual reality equipment enhanced with outward facing cameras.

The project will benefit those developing the project as this is technology that has potential in their industry, and can increase their employability. It gives the developers the chance to try out new and interesting technology in a space that allows them to experiment. The project will also allow the team to build our network with people in the industry, including the employees in Shadow Factory. Those developing the project will also benefit by working towards the completion of their degree as well as gaining valuable industry experience.

The timeline for this project will last 8 months, ending in mid-April with the end of the 2018 Sheridan term. Before development begins there will be several phases of testing and documentation. This will start with studying the new technology to understand its capabilities and limits, then moving into conceptualization and ideation of several potential projects, before finally moving into non-digital prototyping. Non-digital prototyping will reveal the optimal project to move forwards with, and once completed, development on the game will begin.

The largest risk that may present itself in the project is team dynamics. There is a good chance that the team will disagree on different matters, and it is important that the team be ready to handle those situations in a polite and professional manner when those times arise. Another risk with the project is the scope of the game that is being developed. Because the project uses technology that is unfamiliar to the developers, the scope will have to be smaller than other projects in order to fit in time that can be spent researching and learning the full potential of the tech.

1.3 Approval

This project charter formally approves of the game project, Effervescence, and provides the project team with direction to apply resources to project activities described herein. If there is a change in the project scope, the project charter will be updated and submitted for re-approval.

Prof. J.A. Rueda and Prof. Z. Dinath _____ _____
Name and Signature Date
Capstone Coordinators

Prof. J.A. Rueda _____ _____
Name and Signature Date
Production Mentor

Yani Wang **Sept. 27, 2018**
Name and Signature Date
Role Artist

Jennifer Stienstra **Sept. 27, 2018**
Name and Signature Date
Role Project Manager and Narrative Designer

James Pratt **Sept. 27, 2018**
Name and Signature Date
Role Design Lead

Justin Capcap **Sept. 27, 2018**
Name and Signature Date
Role Technical Designer

Michael Arcadi **Sept. 27, 2018**
Name and Signature Date
Role Technical Lead

Keana Almario **Sept. 27, 2018**
Name and Signature Date
Role Art Lead

Section 2. Project Overview

2.1 Project Summary

This project will utilize the technology provided to the team (Mixed Reality (MR) headsets and backpacks) to its fullest. The design challenge is to create a fun and interesting location-based experience for the audience that allows players to move around spaces without the restriction of cables, as outlined by Shadow Factory.

The purpose of creating this project is to create cool gameplay that allows players to move around spaces without the restriction of cables, all while learning to develop and design for a different platform. Their other purpose for this project is to gain a beneficial relationship with Shadow Factory as they expand to Canada. Having a guiding hand for the duration of the capstone and building their network of connections will be a benefit to the team during their fourth year and beyond graduation.

2.1.1 Pillars

The team's current pillar is the following:

- Players are able to move freely without being restricted by cables.

2.1.2 Personas

The following are personas of the team's target consumers.

Name: Theo Madrid

Gender: M

Status: Long term relationship

Education: Bachelor's degree

Likes: Pineapple on pizza, vaping, and L.A boybands.

Dislikes: Guy Ritchie movies, fountain pens and guacamole.

Bio: Theo is a recent graduate of Biochemistry at McGill University and he has just moved back home from his 5 years living in Montreal on campus.

He is looking forward to pursuing his Master's degree in Biomedical Engineering, but is currently taking a year off to make some pocket cash and to take a breather before going back to school. He is currently looking for a part time job at local businesses so he can help out at home.

His parents recently adopted a new puppy, and much of Theo's time is spent looking after her and helping out his parents at home.

In his free time, he likes walking the puppy, shopping, and playing popular mobile games such as Clash of Clans and Fallout Shelter.

Goals: To make enough money to cover his living expenses for a year in Montreal, to eventually get his Master's degree, to make his parents proud and to get a job in his field.

Name: Alexis Murray

Gender: F

Status: Single

Education: Bachelor's Degree

Likes: Organic produce, Zumba, and shopping at Gap.

Dislikes: Messiness, unfamiliar technology, junk food.

Bio: Alexis is currently working as a charter accountant at a local chemical manufacturing company. She has two kids in their tweens and has been divorced for six years. She is currently in the process of turning vegetarian and trying to minimize junk and processed food in her household, much to the dismay of her kids. She has a basic understanding of popular computer programs such as Excel, Word and PowerPoint and her email.

Her two kids love video games, and she supports them learning new technology and games. However, she does thoroughly do her research on each game they ask for. For example, their GTA5 request was quickly shot down after Alexis did a quick Google search.

Alexis takes Zumba class every Wednesday and Friday, and has a walking group that she joins on Monday. She wants to also start swimming classes, but she is waiting until her kids get a little older to be away more.

Goals: To lose 4 pounds, to eat a fully vegetarian diet, to watch her kids grow up happily and healthy, and to retire comfortably at 65.

2.1.3 Project Goals, Design Outcomes and Objectives

No.	Goals	Objectives	Design Outcomes	Measurement Criteria
1	Design a game that utilizes the tech provided and its strengths	• Research the tech the team has and learn the limits • Produce documentation for the tech	• Learn how to design for the tech provided • Learn how to design solid game mechanics that utilizes the capabilities of the tech	• Frame rate doesn't decline below 90 fps. • Have a rate of user error less than 10%
2	Design a game that people find fun	• Improve the game based on playtest feedback • Playtest regularly	• Have a quality portfolio piece • Gain credibility within the industry • Create detailed and useful playtest reports	• Get at least 100 followers on the team's social media accounts. • Get an average of 40 engagements per tweet • Get featured on at least 2 websites • Get an average score of 8/10 when playtesters are asked to rate it.
3	Produce a working and polished proof-of-concept	• Develop an organized schedule • Weekly scrum meetings and constant communication • Follow agile development techniques	• Hone time management and agile development skills • Gain experience in working on and finishing a long-term project	• Having 0 game breaking bugs and 0 crashes. • All necessary art assets and textures are implemented.
4	Improve employability	• Hone crucial skills • Develop networking skills	• Have a quality portfolio piece • Make strong connections in the industry	• Everyone in the team receives at least 1 job offer after graduation. • Make at least 10 new professional connections by the end of the year.

2.1.4 Key References

Below are some references that inspire the team for this project.

Reference	Reasons for inspiration
Shadow Factory	The team's design challenge was provided by Shadow Factory and will be the foundation of the project.
GrabBag (2018)	This game is developed by Shadow Factory, the team's sponsor for this project and uses tech similar to what they'll be using.
Keep Talking and Nobody Explodes (2015)	The team likes the asymmetrical gameplay with two players playing together but doing two different things.
Tag Hide and Seek Treasure Hunt	These physical games inspire the team because the players have unlimited freedom of movement, which is something the team is aiming to achieve with the tech the team are using.
Kinect/Wii Games	The games on these systems are also an inspiration for the team, as they have similar results that the team wants to achieve for their capstone: creating a digital game that allows freedom of movement.

2.1.5 Project Scope

The developers want to create a game that utilizes the strengths of the tech provided, especially its **portability** and **Mixed Reality capabilities.** The team is aiming for a **working** and **polished proof-of-concept.**

2.1.6 Scope Definition

The team estimates the project will take approximately 6 months to create, considering the additional course work they will have to do over the next 8 months. The team plans on fully utilizing the capabilities of the HP backpacks and VR/MR headsets provided to them in terms of design, and plan to create a polished proof of concept to showcase the tech and for them to have a go at developing software for new and exciting hardware. After the 8 months, however, the developers do not currently plan on returning to the game to update it. The team is aiming to have a polished proof of concept complete by the end of semester (April 18th, 2019) with the direction and features they want to showcase, which includes:

- Allowing users to free-roam in a virtual 3D environment without the restriction of cables.
- Use of object/hand recognition software to incorporate real world props that can be used in game.
- Avoiding the FPS genre (No firearms, guns, or horde mode game types).
- Fun and engaging single-player experience.
- Incorporate narrative elements

2.1.7 Boundaries

Activities In Scope	Activities Out of Scope
1. Develop the game	1. Submit the game to various conventions and conferences
2. Develop GDD and documentation for the technology	2. Networked multiplayer

Activities In Scope	Activities Out of Scope
3. Metric testing of the equipment	3. Making a shippable project.
4. Regular playtest sessions	
5. Research (tech capabilities and playtest methods)	
6. Acquiring previous documentation of the tech through research and/or peers	

Attending additional conferences to show off the game will take away additional time and resources from developing the game. As the final objective of this project is to develop a prototype showing off the game at this point is not necessary. Not only that, but attending these events is primarily for networking and engaging with the public, not for completing the project.

Networking for multiplayer is an area that the team does not have any experience in, and given the time constraints of the project and expected difficulty in doing so it is outside of the scope of the project.

Research, on the other hand, is an important part of the project. The team will be using new tech that none of them have ever used before, so it is critical that they learn what they can about it before they move forward. The worst thing that could happen is that the team develops a concept and design the game and later realize they can't do a core mechanic because they hadn't done their research beforehand.

2.2 Milestones

Project Milestone	Description / Requirements	Expected Date
1. Game idea brainstorming	• List of 20 (or more) game concepts	September 26, 2018
2. Tech research	• Tech and optimization document (for internal use) outlining optimization methods for the rest of the team • Tech demo (found elsewhere) that the team members can use to familiarize themselves with the tech	October 5, 2018
3. Conceptualization	• List of 8 game concepts to test out • Short description of each concept, outlining the mechanics and how it could be physically prototyped	October 8, 2018
4. Paper/Physical prototypes	• Short report of the results of each concept's paper/physical prototypes listed in Project Milestone #2 • Narrowed-down list of 3 (or fewer) game concepts most preferred by the team members	October 10, 2018
5. Game design document (first pass)	• First pass of the GDD for the game concept that has been decided on by the team	October 17, 2018

Project Milestone	Description / Requirements	Expected Date
6. Alpha build	• First pass of the game • Functional build • Concept art and first pass of assets, not necessarily implemented into the build	December 7, 2018
7. Alpha playtest sessions and reports	• Documentation of hosted internal and external playtest sessions • Survey results from playtester feedback • Alpha build playtest report	February 1, 2019
8. Beta build	• Second pass of the game • Functional and playable build • Implemented high-priority art assets	March 1, 2019
9. Beta playtest sessions and reports	• Documentation of hosted internal and external playtest sessions • Survey results from playtester feedback • Beta build playtest report	March 25, 2019
10. Finished project	• Fully playable game • Playtested and bug-tested build • Implemented all art assets	April 1, 2019

2.3 Deliverables

Project Deliverable 1: Game Design Document	
Stakeholder:	Internal
Description:	An initial draft of the game design document
Acceptance Criteria:	An acceptable game design document draft will include information on core game mechanics, narrative, player progression, and visual direction.
Due Date:	October 3rd, 2018
Project Deliverable 2: Game Prototypes	
Stakeholder:	Internal
Description:	A number of non-digital prototypes demonstrating the mechanics of potential ideas.
Acceptance Criteria:	A minimum of 3 prototypes that have been developed mechanically and have the potential to be developed into a fully fledged idea.
Due Date:	October 10th, 2018
Project Deliverable 3: Final Deliverable Prototype	
Stakeholder:	Sheridan College
Description:	A completed prototype.
Acceptance Criteria:	Prototype demonstrates required learning outcomes by Sheridan College as well as serving as a unique and interesting game that takes advantage of portable, cordless virtual reality headsets.

Project Deliverable 1: Game Design Document	
Due Date:	April 18th, 2019

2.4 Dependencies

Dependency Description	Critical Date	Contact
The team is depending on the knowledge and previous documentation of other students, both current and former, who have used this tech before.	October 5, 2018	YRP projects: Raphael Tetreault, Vincent, Keita, etc. Challenge details: Keiran Lovett
The team is depending on the results of their own research regarding the potential tech capacity and restrictions.	October 5, 2018	Keiran Lovett, Raphael Tetreault

2.5 Project Risks, Assumptions, and Constraints

2.5.1 Risks

No.	Risk Description	Probability (H/M/L)	Impact (H/M/L)	Risk Management Plan	Team Member Responsible for Resolution
1	Breakdown of team dynamics caused by disagreements, lack of communication, etc.	M	H	• Separation of affected team members. • Mediated discussion the next day.	Jen.
2	Game lags / does not hit a high-enough FPS (90FPS).	H	M	• Run the profiler, address what needs to be fixed. • IF ART (most likely): Optimized assets, change art direction (worst case scenario). • IF CODE (least likely): Optimize code, ask for tech mentor's help.	Keana, Yani, possibly Michael and Justin as well.
3	Scope too large for the team	H	M	• Remove low-priority features. • Playtest every time a feature is removed to see if the game is still enjoyable.	Michael, Jen.

No.	Risk Description	Probability (H/M/L)	Impact (H/M/L)	Risk Management Plan	Team Member Responsible for Resolution
4	Scope not large enough to challenge team	L	L	• Use modular assets to create more levels • Playtest each time a new level is added.	Whole team

2.5.2 Assumptions

The following table lists the items that cannot be proven or demonstrated when this project charter was prepared, but they are taken into account to stabilize the project approach or planning.

No.	Assumptions
1	Everyone will be responsible and do the tasks they were assigned.
2	The team members' roles will not change in the middle of development.
3	The tech will be provided for the team.
4	The team is expected to make a Mixed Reality (MR) game.
5	The team does not disband or lose any members in the middle of development.

2.5.3 Constraints

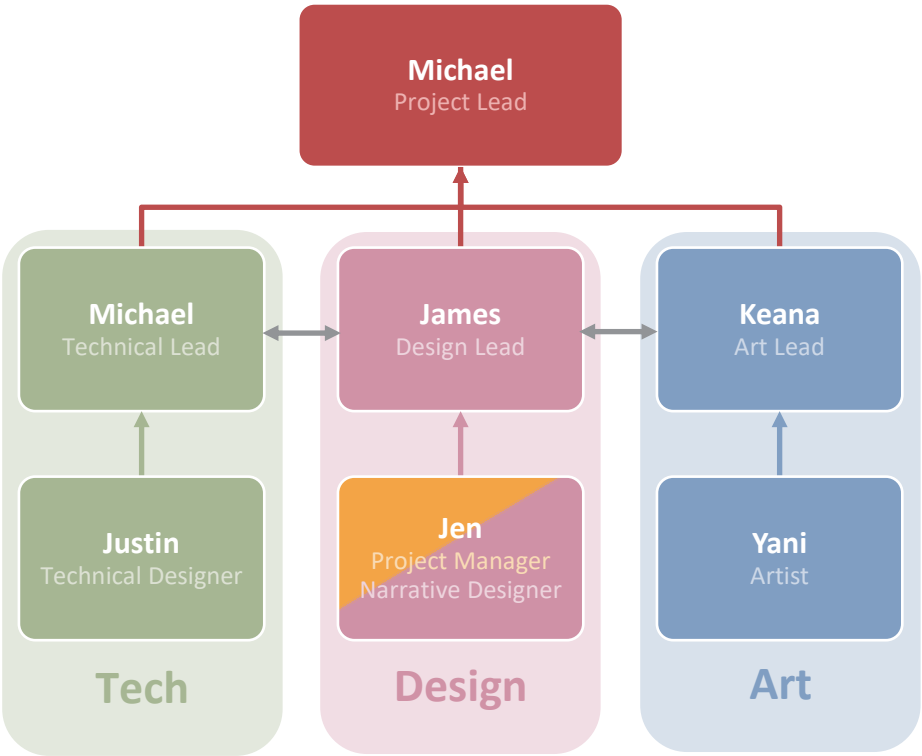
The following table lists the conditional factors within which the project must operate or fit.

No.	Category	Constraints
1	Time	• The team has only around 8 months to develop the game, along with balancing course work from other classes • The team members' personal lives and schedules differ from each other, making it difficult to sync up work schedules.
2	Place	• The game must be playable indoors.
3	Technology	• Project has to utilize the headset and backpack provided. • The game must be optimized and run at over 90FPS.
4	Content	• The game must fit within Sheridan's Code of Conduct.

Section 3. Project Organization

3.1 Project Governance

Each area of the project; design, tech, and art, is managed by two team members who share the responsibility of that area. Michael, James and Keana will be responsible for making any final decisions in their given area as well as communicating these decisions and their effects on other areas to each other. Jen serves as the project manager and is responsible keeping the project on track as well making decisions in the event that there is a disagreement between the different areas of the project.



This project will comply with Sheridan College policies including:

- Acceptable Use Policy
- Code of Conduct
- Copyright / Intellectual Property
- Harassment and Discrimination Policy
- Student Code of Conduct.

3.2 Project Team Structure

Project Role	Assigned to
Project Manager	Jen
Technical Lead	Michael
Technical Designer	Justin
Art Lead	Keana
Artist	Yani
Design Lead	James
Narrative Designer	Jen
Quality Assurance	James
Community Manager	Jen, Keana, Yani

3.3 Roles and Responsibilities

Project Role	Responsibilities	Assigned to
Project Manager	• Ensure that tasks are being completed. • Ensure everyone is working well together. • Check the well-being of teammates. • Adjust schedule if needed. • Adjust scope if needed. • Research for content if required.	Jen
Technical Lead	• Set up systems for standardizing development and documentation across multiple developers. • Code and implement game systems and overall gameplay functionality. • Fix and debug code errors. • Research the necessary equipment. • Respond to design decisions based on the capabilities of the technology	Michael
Technical Designer	• Adapt between secondary design and programming tasks. • Develop and implement game systems and general gameplay functionality. • Handle bug testing and fix code errors. • Study the tech capacity and limitations.	Justin

Project Role	Responsibilities	Assigned to
Art Lead	• Determine the art style and direction of the game. • Ensures that all assets are consistent with the game's vision. • Make artistic decision based on the design and technological aspects of the game. • Work on 2D, promotional, UI, and concept art. • Potentially work on 3D models and textures.	Keana
Artist	• Research and create various types of art either from scratch or from previous designs. • Make sure art and models are efficiently made and aesthetically pleasing. • Texture models. • Potentially work on 2D, promotional, UI and other types of art.	Yani
Design Lead	• In charge of mechanics, levels, UI, and systems. • Lead the group in creating paper and digital prototypes to help push the direction of the project. • Ensures that all systems coalesce.	James
Narrative Designer	• Brainstorming and creating narrative content. • Helping implement the content in the game.	Jen
Quality Assurance	• Organize both internal and external playtests. • Create QA reports based on feedback provided.	James
Community Manager	• Create social media accounts on Twitter and Instagram. • Promote both the team and the project online and gain followers. • Regularly post work-in-progress shots to the team's social media accounts.	Jen, Keana, Yani

3.4 Project Facilities and Resources

This project requires the use of:

- HP Omen X Compact computers
- HP MR headsets, and
- Zed M cameras.

The team currently has access to:

- HP Z VR Backpack G1 Workstations
- HP MR headsets
- Zed camera, and
- Zed M camera.

Should the team need more of these tools, or other tools that they believe will help them achieve their goals, the team will put in a request to their production mentor, Jose Rueda.

Section 4. Project References

More information concerning this project can be found in the following documents:

Document Title	Version #	Date	Author and Organization	Location (link or path)
Project Brief (one page text, one page poster)	TBA	TBA	Hexabyte Games	TBA
Game Design Document	TBA	TBA	Hexabyte Games	TBA
Acceptable Use Policy	4	6/12/2018	Sheridan College	*sheridancollege.ca > Student Guide > Academic Policies and Procedures > Documents and Policies >* *https://policy.sheridanc.on.ca/* *https://policy.sheridanc.on.ca/dotNet/documents/?docid=1033*
Copyright/Intellectual Property	1	9/15/2017	Sheridan College	*https://policy.sheridanc.on.ca/dotNet/documents/?docid=920*
Harassment and Discrimination Policy	6	5/31/2016	Sheridan College	*https://policy.sheridanc.on.ca/dotNet/documents/?docid=904*
Student Code of Conduct	1	6/18/2018	Sheridan College	*https://policy.sheridanc.on.ca/dotNet/documents/?docid=1036*

Section 5. Glossary and Acronyms

Term	Definition
Mixed Reality	Merging of real and virtual elements to produce new environments.
Acronym	**Name in Full**
FPS	First Person Shooter
GDD	Game Design Document
MR	Mixed Reality
VR	Virtual Reality

Appendix F: Development Logs

These development logs showed our design thinking and process throughout the project. Each team member had a **personal blog** where they would write **updates** on the project, **problems and solutions** they ran into, etc.

KEANA ALMARIO
Hexabyte Games

OCTOBER 12, 2018 BY KEANA VICTORIA ALMARIO

Starting Capstone Year

Hi, I'm **Keana Almario**! I'm a game designer from the Philippines, and I also specialize in illustration and 2D art. This year, I'll be the **Lead Artist** of **Hexabyte Games**.

Meet the team! From left to right: Justin Capcap, Michael Arcadi, James Pratt, myself, Jennifer Stienstra, Yani Wang. Photo by Nate Davis.

In this post, I'll be describing the details of the sponsored project, the technology we're using, and the design challenge we decided to pursue.

Details of the Sponsored Project

For capstone, our team is working on a sponsored project from Shadow Factory, whose challenge for us was:

> "What would be cool in terms of game play in Virtual Reality (VR) that allows players to move around spaces, buildings, in other words, **without the restrictions of cables**?"

The "without the restrictions of cables" part is really important, because we will be using the **HP Z VR Backpacks** provided by Sheridan and HP!

The HP Z VR Backpack G1 and its accessories. Image from the HP Official Store website.

The HP Z VR Backpack, when worn. Image from the HP Official Store website.

The HP Z VR PC itself is like a light and portable computer tower. You can attach it to the harness and wear it like a normal backpack. There are also small batteries on the sides of the harness that you can switch out and charge. It's really refreshing because you don't have to worry about tripping over cables when facing in different directions. The backpack is surprisingly light, too!

Here's another cool thing — by adding the mountable **Zed M Camera**, we can turn Virtual Reality (VR) into Mixed Reality (MR)! Seeing virtual objects in the real world through a VR headset is something that we think would work really well with the VR backpack.

The Zed Mini Camera, by Stereolabs. Image from Engadget

Because our team is dealing with this new and innovative technology, we'll be spending more time than usual to test it, play with it, and design for it. Our priority for this project is to **design a game that fully utilizes this mobile VR/MR technology**.

A Design Challenge to Push Us Forward

In addition to Shadow Factory's design challenge, we wanted to think of another aspect to really push our design thinking. We didn't just want to do *any* MR game – we wanted to jump into something new while we were still in school. In the end, we decided our design challenge would be:

> "How do we create **asymmetrical multiplayer gameplay** in which only one player is in **Mixed Reality**?"

We chose this challenge because we thought it'd be a really interesting one to tackle. Most of us in the team had done asymmetrical multiplayer games before, but never in MR. We feel that the MR aspect is bound to change our whole way of thinking (since we need to design *for* the capabilities of MR).

Looking back, this is the first time in the whole 4 years of the program that I've willingly pushed myself in a weird design direction. I think this is also because I'm with a team that's willing to try new and strange things, which I'm really glad for. I'm looking forward to this year, and how our project will unfold!

UNCATEGORISED

OCTOBER 12, 2018 BY JAMES PRATT

Devlog #1- The Importance of Physical Prototyping for Mixed Reality Games

Mixed reality. The future of interactions, a brand new world coexisting on our physical world. Working with mixed reality (MR) sounds cool right? On paper, sure it does!

'You're trying to tell me, that I can look at my actual hand and actual fire will come out of my actual hands actually? That actually sounds neat!"

Yet how do you design for this? Ah, less intriguing now right? It's kind of like me asking you if you want a hot fudge sundae and then showing you a cow and an ice cream maker and saying "well, get to it then!" This has been the constant state of mind I've been in since we took on the challenge of **creating an asymmetrical multiplayer MR game** for the past 6 weeks. Wait, what- now there's asymmetrical multiplayer involved? That wasn't part of the deal, I want my money back! To help visualize the problem, I've restated it to something less abstract and something a bit more concrete:

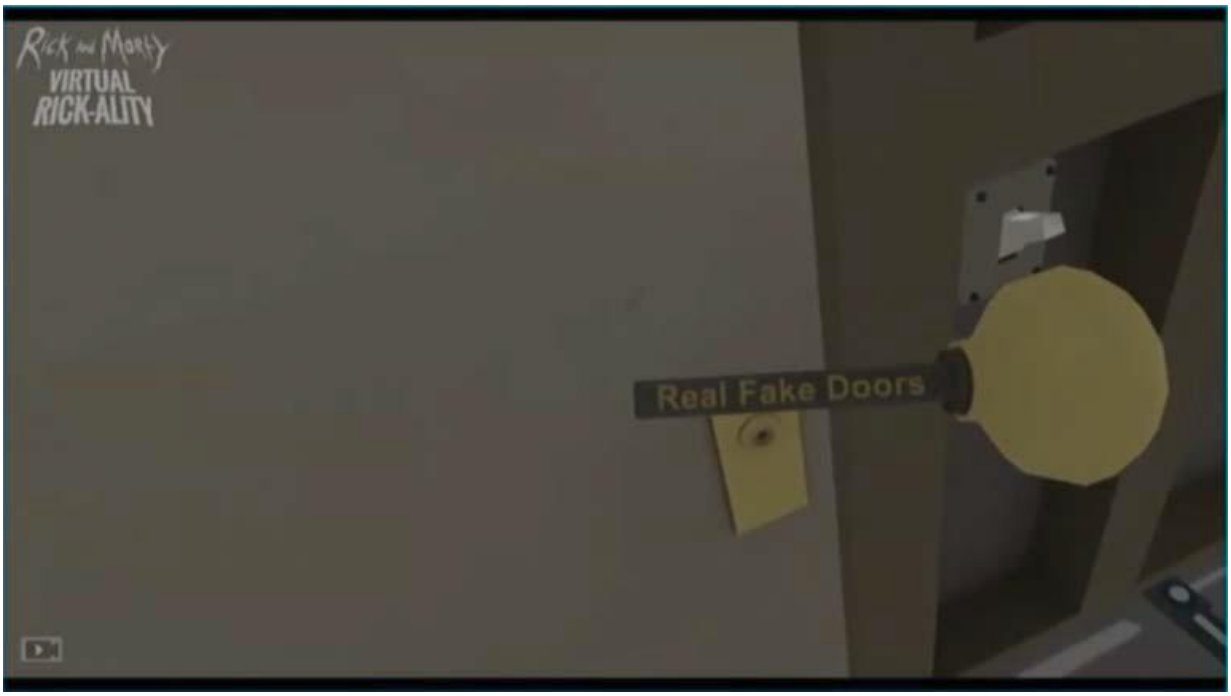
How do you design an engaging and immersive game world using the real world around you?

YOU PROTOTYPE

To quote Nicole Lazzaro from her **Matrix vs Pokemon GO** GDC talk,

'[With VR games] The world itself is a genre, and the interaction with the world is the game."

What she means is that the world defines the actions and goals in which the player engages in within it. Take a look at Rick and Morty: Virtual Rick-ality. In it, Owlchemy Labs recreated Rick's lab in the show, and in their GDC talk, they mention that they aimed to be as accurate to the show as possible. Why? Because the genre is a simulation; the game is simulating what it would be like to be in the show, *Rick and Morty,* and the game is interacting with the world. This is why Owlchemy made sure that everything that looks interactable in the game *is* interactable. For example, there's a door behind the player that would lead to the rest of the Smith household, but obviously creating a fully realized house would be a task. Yet having a doorknob that the player can't actually interact with doesn't feel right; it breaks immersion. So what did they do? They did this:



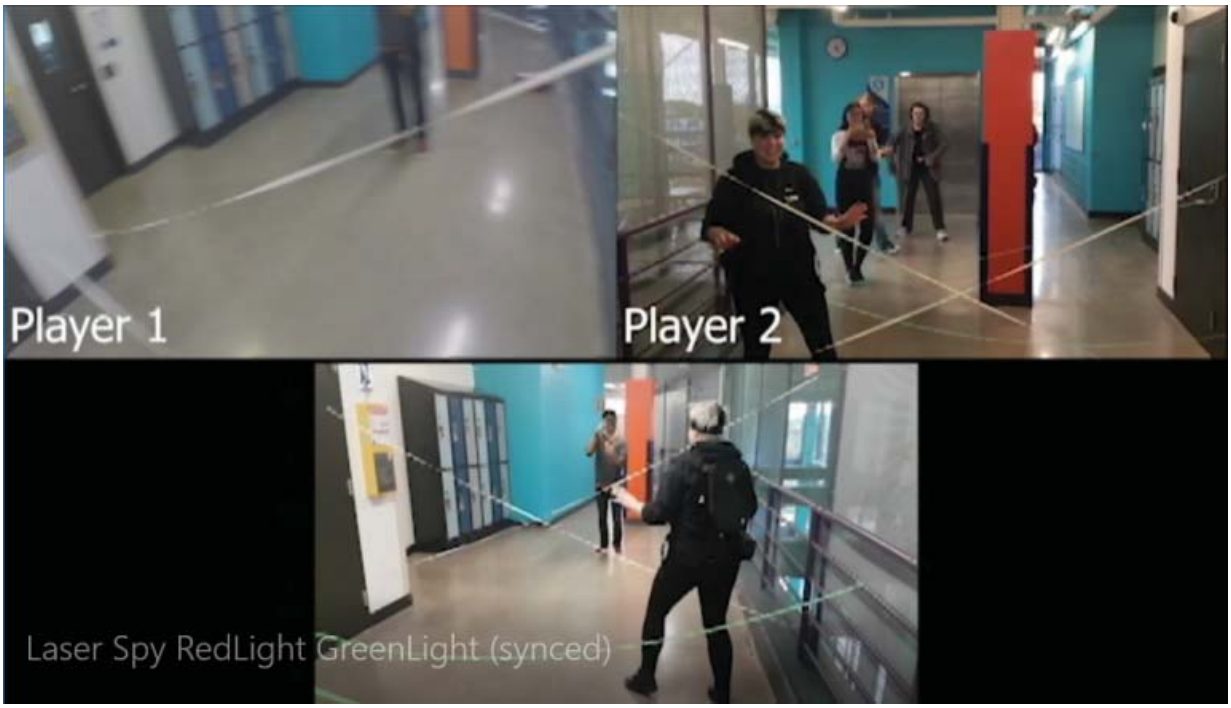
This kind of thinking is what I brought to the team when prototyping, but the issue being is, how does this kind of thinking translate into MR?

Okay so let me explain: with VR, you can **create** an environment the player can roam around in. With MR, you **incorporate** the game world into the real world the player can see. Early on, our team decided that if this game is going to be MR, then there has to be a reason, it can't be arbitrary like being able to wave to your boyfriend while killing zombies (which might be the best Hallmark commercial ever conceived). So what would be the reason for MR? Well, let's take a look at that Hallmark commercial again; what if you could play a game with someone who can't see the world you can see? From there, we decided that we were going to develop an asymmetrical MR

"Get to the point, what did you do?"

Alright, so beforehand, we ran a few paper prototypes where we had one of our team members, Jen, don our makeshift MR headset to emulate what the setup would be like. We had her perform a few mechanics we wanted to test while recording it through the camera on her head. We found that while it was interesting to move around freely due to our equipment (essentially a computer backpack), but where we really started to find success was when another team member filled in as an “AI partner”. The consensus? Having someone work with/against you is a lot of fun

To test this out even further to isolate what we liked about the asymmetrical multiplayer, we came up with a concept for a red-light green-light game. For this, we had Jen try to steal an object while another team member, Justin, tried to catch her in the act. After some iterations involving spotlights, lasers, and our best alarm impressions, we solidified asymmetrical gameplay as one of our main pillars



https://drive.google.com/file/d/1CKD3GcIP_Di4qHMAYrWYpbnR40FJCPuY/view?usp=sharing

What did I learn?

VR/MR games need to be developed as VR/MR games, and not the other way around. What I mean is that you can't just slap Mario into MR and call it a day. These games take advantage of depth, which is impossible on a 2D screen. In order for the design to work, the environment needs to facilitate the interactions of the player, and with that it involves depth. I also learned that there will never be enough Clorox wipes for the amount of sweat produced from 4 hours of extensive VR research.

So what now?

We have an *abstract* idea for a game, but nothing concrete. As of now, we seem to have a game concept we really like and want to finalize. The concept heavily borrows from *Keep Talking and Nobody Explodes* use of communication between players given different information. The team and I plan on prototyping this concept today to see if it's something we want to pursue and move forward with, but I'm very excited to see where this goes!

References

'Matrix' vs. 'Pokemon GO': The Mixed Reality Battle for the Holodeck by Nicole Lazzoro

'Rick and Morty: Virtual Rick-ality*' Postmortem: VR Lessons *Burrrp* Learned* by Alex Schwartz and Deven Reimer

OCTOBER 12, 2018 BY JENNIFER STIENSTRA

The Process of Brainstorming and Prototyping with Unfamiliar Tech

By Jennifer Stienstra

Prototyping proved to be an interesting challenge for our team. As of right now, we currently have no solid game idea like other teams. There multiple reasons for this, the primary ones being that we are using hardware the team isn't completely familiar with, and we weren't sure what exactly we'd be capable of doing with that tech.

New Tech

We are making a game in MR using HP Z VR backpack computers with the MR headsets, which are portable and allow players to move around. Strapped onto the MR is a Zed M camera, which allows the player to view the outside world while wearing the headset. We are also using Leap Motion, allowing detection of hand gestures in the real world and imitating them in the virtual one.

Leap Motion

MR Headset

Zed M camera

HP Z VR Backpack G1 Workstation

Only one team member has experience with VR, which is the closest to MR, but no one had ever used that tech before. Despite the unknowns, we were eager to try something new.

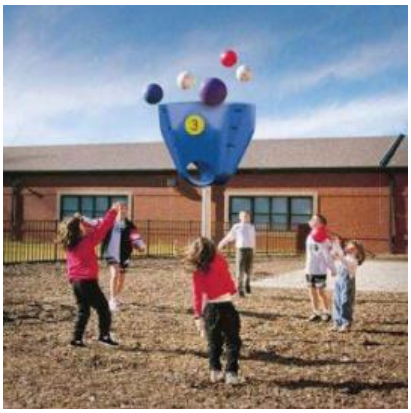
On the downside however, because we were unfamiliar with the tech, research had to be done in order to understand what the tech was capable of, and what constraints we were going to have to work around.

Brainstorming and Prototyping

Since time had to be spent doing research, we've come to an agreement that our game will have to be a smaller scope than other teams because we'd have to spend some time doing extra work and our schedule needed to reflect that. Once the research concluded, we began the process of brainstorming different possible mechanics and ideas, and prototyping them. We kept our physical prototypes pretty bare bones, just focusing on different kinds of mechanics that were inspired by playground games and escape rooms.

We tested these prototypes while wearing the backpacks in order to see how it would feel to be playing and moving around with them on. We found that they didn't limit movement very much, it only slightly slowed their movements because they were conscious of the computer on their back, but it wasn't enough to have an impact on any potential game ideas we would have. We also learned that moving around freely was definitely the most appealing aspect of our initial tests. It was then we decided that movement would be one of our core pillars.

We continued testing, taking inspiration from playground games as they were very active. Some ideas we tried out included sneaking around obstacles, a variation of green light red light, and searching for objects around an environment.



We were inspired by playground games because of how active they are

While testing, we learned that asymmetrical multiplayer had the potential of being a fun addition to the game as well. We were testing for some concepts with one team member being the player and another being an "AI" in the physical prototype. Later, we realized that having the social aspect made the game more enjoyable than playing alone, with one person wearing the headset, and the other player(s) not wearing one, and decided to try and focus ourselves in that direction.

Our team made another core pillar of our game asymmetrical gameplay and focused more prototypes with this feature.

Challenges

When our team gathered to discuss the results of our prototypes and to begin conceptualizing a game idea to move forward with, we inevitably encountered some challenges that we knew we were going to face. The first challenge was ensuring that the game was fun for all players regardless of whether or not they were the ones that were wearing the headset. This included making sure that the game, if it was co-op, was purely the headset player yelling out instructions and the others following them, but having a back-and-forth and working together

Another challenge we foresaw was specifically in a co-op game, what would stop the player wearing the MR headset from doing all the work themselves, rather than relying on another player to help them?

Michael and Keana during a brainstorming session. These meetings helped us flesh out mechanics and bring up potential design challenges

Addressing these challenges early on is important, and will help us make informed design decisions as we continue development.

Moving Forward

As we continue to develop our game, keeping the challenges we discovered as well as our core pillars in mind will be important so that we don't lose focus. Prototyping and playtesting will continue to be necessary to make sure that those challenges are being solved and that the game is also an enjoyable experience.

JUSTIN CAPCAP

Game Designer

OCTOBER 12, 2018 BY CAPCAP

Technical Dev Log – Baby Steps

For this dev blog I'll mainly be talking about the initial setup process that we implemented for all the equipment we're using.

Just a quick summary regarding our project. We're working on a sponsored project from Shadow Factory. The goal is to develop a location based Mixed Reality game that utilizes the portability of these HP VR Backpack Computers that we are provided with. This project heavily emphasizes on the portability and the ease of not having to deal with wires and cables.

This meant that before we could jump into any sort of game development, we needed to do extensive research about the equipment and handle setup procedures. Essentially we needed to establish a working setup of Mixed Reality, Zed M Camera, and Leap Motion all working together in Unity 3D.

An external issue that we came across during setup was our lack of equipment. We were only provided with one Mixed Reality headset so we found it difficult to keep passing the headset between myself and the other technical designer in our team. In response, we decided that it would be vital during the development stage to request another Headset to maximize our time. But in the mean time, we just ended up splitting the tech research and setup. My co-technical designer in the team, Michael Arcadi took the bulk of the Mixed Reality Headset and Zed M Camera research while I took care of the Leap Motion aspect.

Leap Motion at its essence is advanced hand tracking technology that allows players to bring their AR/VR experience to the next level. It essentially enables players to play a game with their bare hands, without the use of controllers.

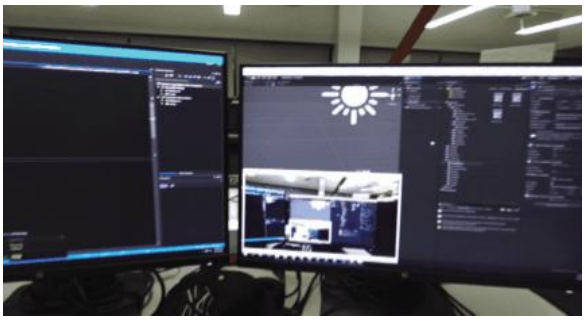
Setting up the leap motion went pretty smoothly. The core assets needed to implement it into Unity 3D was readily available and didn't cause any initial hiccups during installation. The company website also has extensive documentation regarding C# API.

Link: https://developer-archive.leapmotion.com/documentation/v2/unity/api/Leap_Classes.html

After setting it up, I got to play around with it in Unity. I found out that setting it up as a headset mount causes a bit of inaccuracy in terms of hand placement. Eventually we concluded that this is because of how the sensor itself is placed relative to the Zed M Camera.

This was then remedied by going through a script within the leapmotion core assets. This script handles the available offsets options, and allowed me to add my own offset values to compensate for the inaccuracy.

This is the final result of the combined setup we've been working on for the past few weeks.



OCTOBER 12, 2018 BY KEANA VICTORIA ALMARIO

Devlog #1: Designing in Unfamiliar Territory

A poster for our project, depicting the "MR experience."

For the past few weeks, we've been researching the tech we're using for the project. We've also been prototyping little mechanics and small game ideas, while focusing on our core pillars:

1. movement around the physical space; and
2. cooperation between a player in MR and other player/s in the real world.

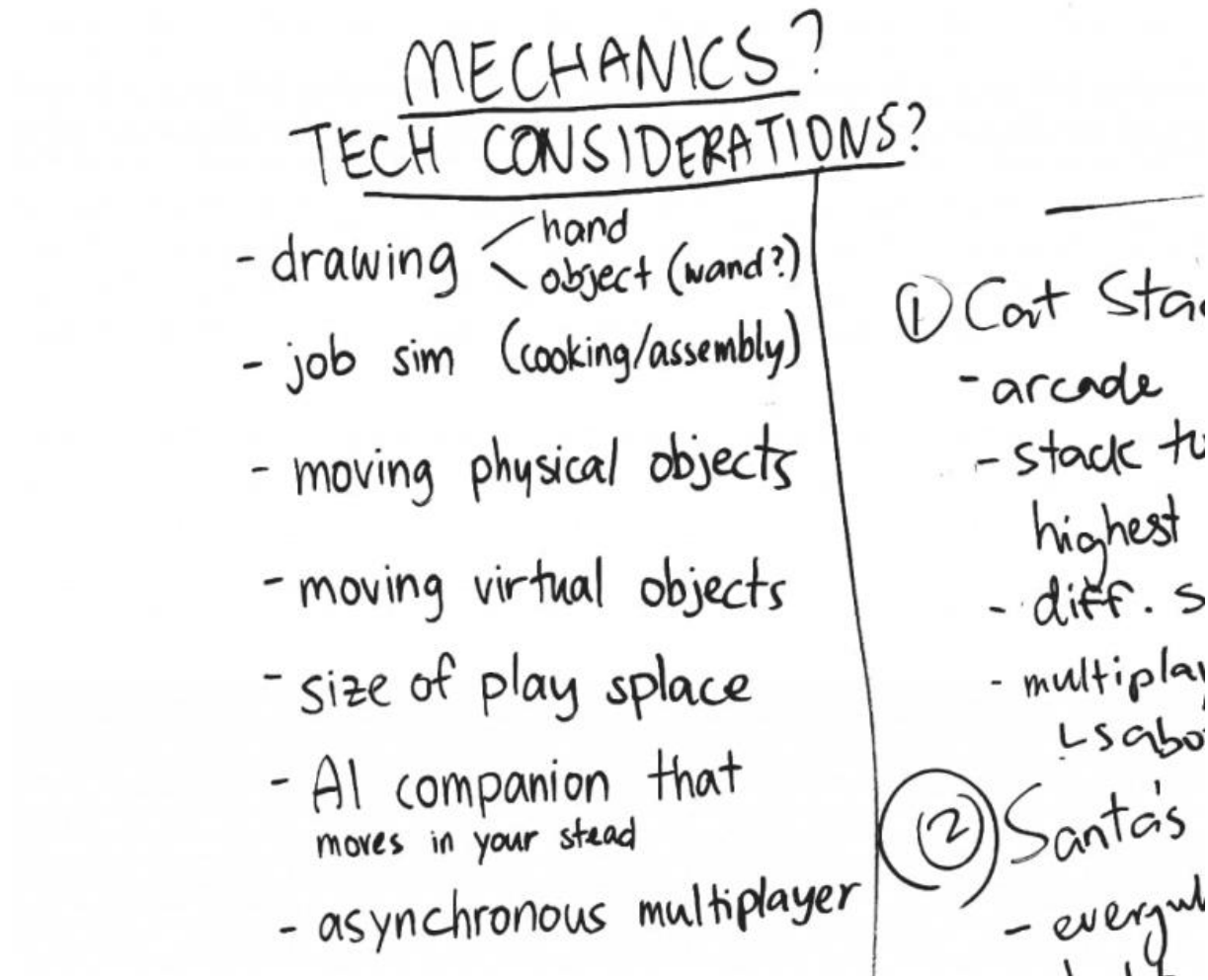
I haven't been doing art aside from quick storyboard sketches from brainstorming meetings, so this post will be more production- and design-focused!

How did we deal with unfamiliar technology?

Mixed Reality (MR) is unfamiliar technology to us, so we had to research what we were working with first before thinking of a game idea. Otherwise, we would just be making an MR game *for the sake of making it in MR*, instead of creating something that wouldn't be as good in other medium. So, we agreed that we would set aside 1-2 weeks for just researching the tech, before actually brainstorming.

At some point, our programmers started to have a tough time focusing on how to test the tech, because we didn't have an idea yet. Soon enough, team team fell into a loop of "we don't know enough about the game" and "we don't know enough about the tech." We felt pretty stuck for a while.

We all agreed that we shouldn't keep feeling stuck, so instead of trying to think of fleshed-out game ideas, we decided to test out many tiny game mechanics based on what we already knew about the tech. Our workflow became a series of quick back-and-forths between 'seeing what the tech could do' and 'prototyping mechanics based on the tech.'



Some of the little mechanics we thought boiled our ideas down to.

Looking back, I feel that we made a good decision to hold back on brainstorming too far. Personally, I had gotten so used to equating 'progress' with 'creating assets for a game and seeing it move' over the past three years, so I was *itching* to start making things. But I realized that as designers, we need to hold back on production and *really* plan things out, so that we don't realize our mistakes too late (and end up wasting people's efforts).

From small mechanics to medium ideas

I mentioned that we tested out many tiny game mechanics first, based on the our programmers' first pass tech research.

We knew that:

- the player in MR (who I'm going to refer to as "the MR player" from now on) will be able to see their surroundings and other people;
- the MR player can physically walk around the space;
- virtual objects can be obscured by real-world objects, thanks to the Zed Mini Camera;
- the MR player could draw and do hand gestures, thanks to the Leap Motion; and
- we wanted to avoid having a shooting mechanic, since it seems to be the common mechanic among current AR/MR games.

From these, we could already test out a variety of little mechanics. Using a GoPro to simulate a MR headset, we paper prototyped pointing, drawing, searching, hiding, etc.

Meeting notes.

After prototyping, we narrowed down which mechanics we liked best: searching and hiding. We also liked parts of the other mechanics that involved an "AI" — mainly because we enjoyed playing with other "people." Through these discoveries, we set our pillars and narrowed our focus little by little.

What about art?

To complement the skillset of the artists of the team, we decided on a **cartoony and simple art style**. This decision goes well with our tech consideration: our game would need to have **low-poly, simply-textured, and optimized assets** so that it can run well, with as little lag as possible.

Moodboard for our art style and assets. Art and images by Chamizo, Cordingley & Wasser, @LemonsOnSticks, Meshtint Studio, Owlchemy Labs, paulopina, and Romani.

Going forward…

Now that we have a concrete design challenge, our efforts are much more focused. We've noticed this trend too: it's a lot easier to answer "does this idea fulfill our pillars?" instead of measuring the idea's worth by descriptors like 'good' or 'needs improvement.'

For the next few sprints, we will be deciding on a game idea we want to pursue. With our idea finally solidified, I will make mockups and concept sketches of the game that the team can refer to.

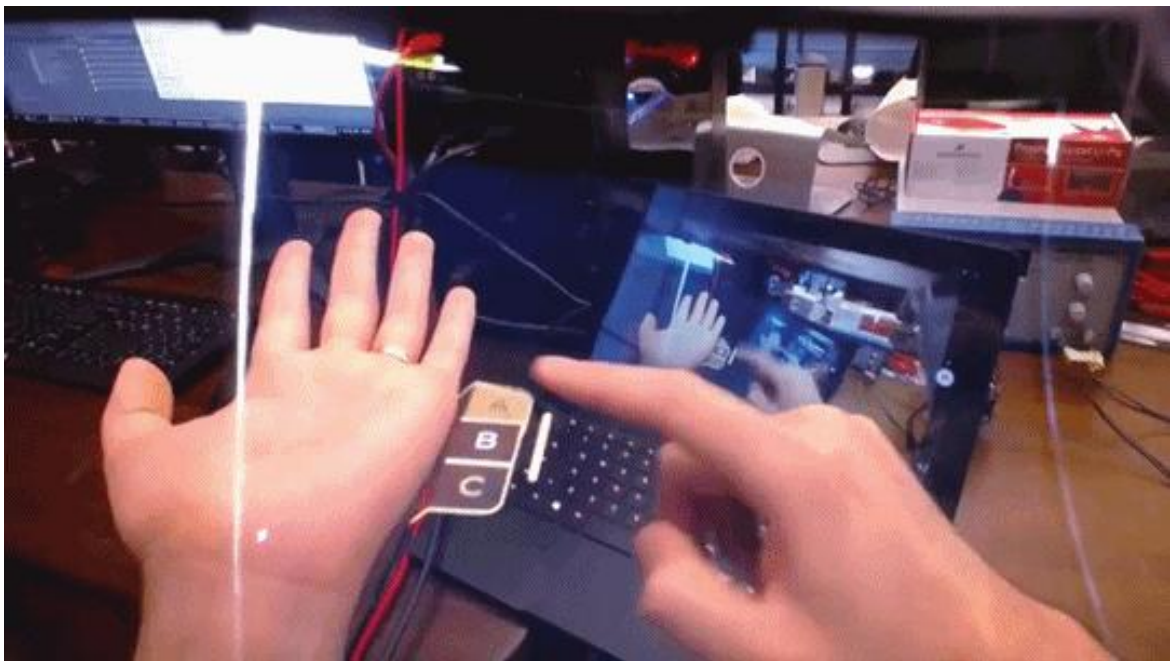
DESIGN

October 12, 2018

THE WONDERFUL WORLD OF WINDOWS MIXED REALITY

—

So over the past few weeks I've been working with HP's Windows Mixed Reality Headset to try and make nifty future type games that kind of look like this:



GIF by Keiichi Matsuda, showing off Leap Motion's Project North Star

Over the time that I've been working with the Mixed Reality Headset I've learned a few things that might be helpful to someone else, so I'm going to put them here.

The first thing that you'll probably notice is that this is a "Mixed Reality" headset as opposed to your normal Virtual Reality (VR) headsets and you might be thinking that its some sort of combination of Augmented Reality (AR) and VR (which is just more AR if you think about it.).

In reality though the HP Windows Mixed Reality Headset is just a normal VR headset, much like the Oculus Rift and HTC Vive. It works with your VR games, and does all the VR things that normal VR does. The reality of Windows Mixed Reality is that Windows Mixed Reality is a product line that covers a wide range of wearable technology from VR headsets to the HoloLens. This particular headset is a VR headset under the Windows Mixed Reality brand.

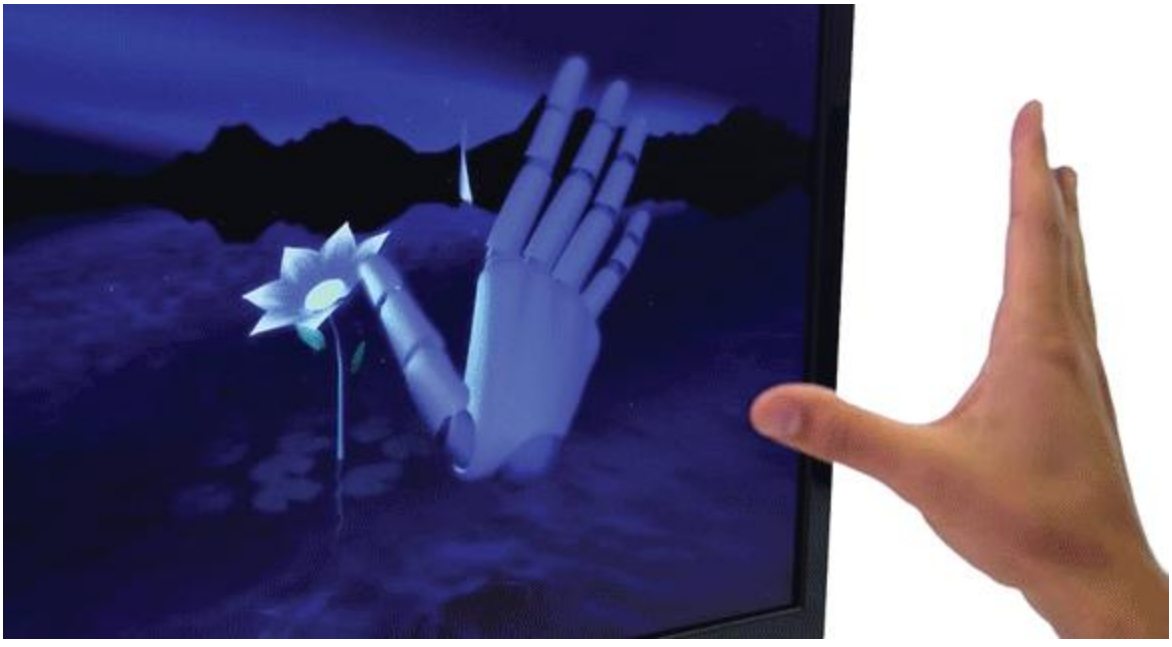
But what about those camera looking things on the headset? Can't I use those to turn it into a nifty AR headset like a HoloLens? Well those camera looking things on the front of the headset are actually sensors for the controllers, much like the sensors that come with the Rift and Vive. While you can't use them as outward facing cameras (at least to my knowledge) they do make setting up the headset a lot simpler than a Rift or a Vive since all you have to do is plug in the headset and your good to go. No worrying about needing extra plugs for more sensors or trying to figure out where to fit sensors on your desk so that they'll calibrate properly.

SO if the Mixed Reality Headset is actually just a VR headset, how do we do all the fancy real world jazz hand stuff? Well, the first thing that we're going to need is a camera.

Enter the ZEDm camera, a camera specifically designed to work with VR headsets to give them AR capabilities. What's neat about the ZEDm is that it can sense depth, which gives it a leg up compared to using a normal camera for AR as it can simulate virtual objects being obscured by real world objects. The ZEDm is also quite developer friendly and has plugins for both Unity and Unreal, and supports both Rift and the Vive.

Wait, Rift and Vive? What about our HP Windows Mixed Reality Headset (or HPMR for short)? Well, as it turns out the camera itself works just fine with the HPMR, but the issue is in mounting it as the HPMR has a more curved visor compared to the Rift and Vive. That's not to say that it can't be done, but we had to resort to a more... creative solution.

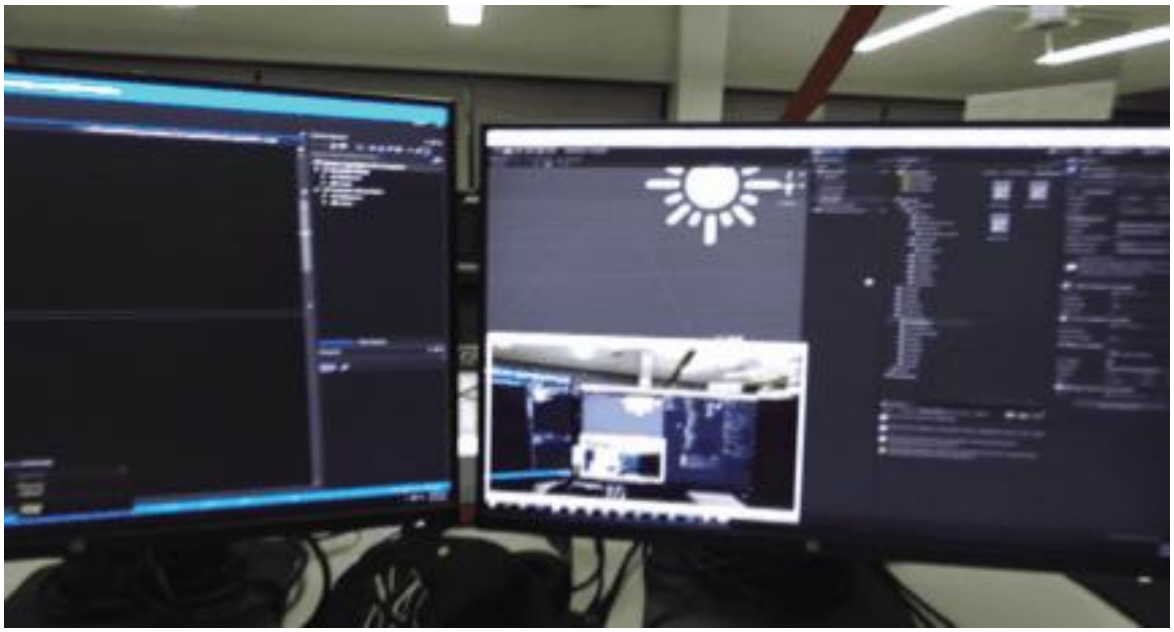
So now we can see, but still need to use the HPMR controllers to be able to interact with things. To get around we add yet another piece of tech, the Leap Motion Controller.



Leap Motion Controller is a small sensor that detects and maps your real life hands to virtual ones as

seen above. Normally you would be in front of a screen and see the virtual hands that you're controlling, or use it in VR as an alternate to using controllers, but because we have the ZEDm we can instead use the Leap Motion Controller to convert our hand movements in AR to input in game.

Wow, that's a lot of stuff strapped to a headset. With all these different cameras and sensors does this stuff actually work? Yes. Yes it does.



The Leap Motion Controller also has plugins for both Unity and Unreal, and from what we've tested it works with the ZEDm fairly well.

So does this mean that in the future that everyone's going to be strapping a bunch of gadgets to their headsets to be able to poke virtual anime girls? Probably not, this is just how we did it. The gif at the start of this post isn't just some mock up, that's Leap Motion's latest project, North Star, an AR headset that's built to do essentially what we're doing. At the time of writing this these headsets aren't commercially available, but the project is open source so if you wanted to you could theoretically put your own headset together if you had the know-how.

For us though it looks like it's going to be duck tape and elastic bands.

DEVELOPMENT LOG OF YANI WANG

A place for me to document my experiences being a game designer and 3D artist.

OCTOBER 11, 2018 BY YA NI WANG

Development Log #1

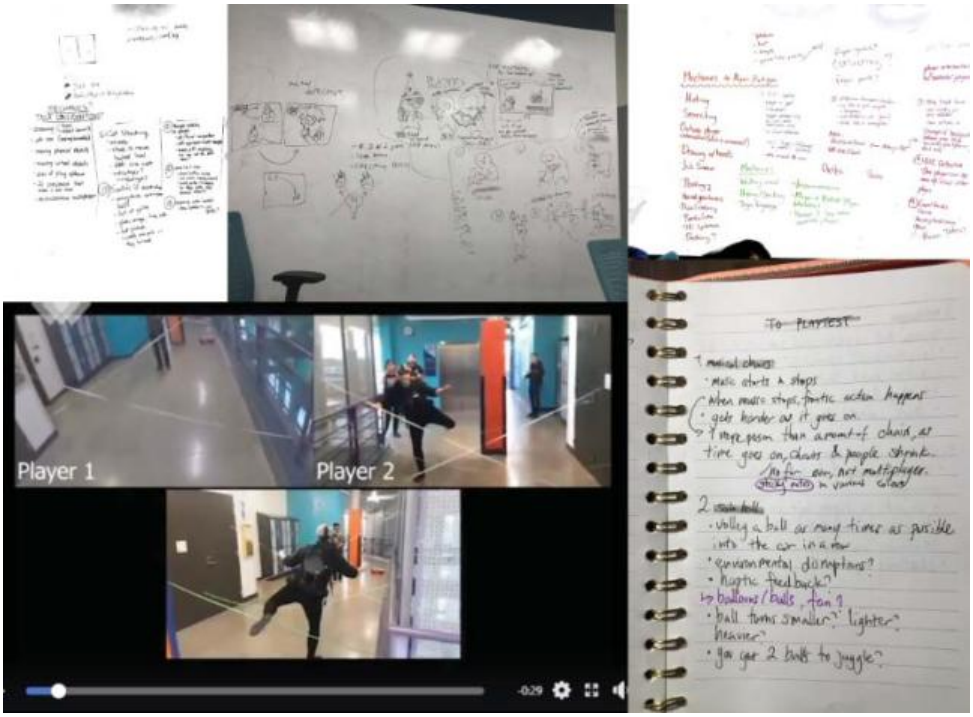
So this is my first development log since year 4 and capstone have started. We're currently on week 6 out of 28-ish, so we're still in our first quarter, and yet it feels like a lot has already happened. We've decided to call ourselves Hexabyte Games, and we're accepting the design challenge given to us by Shadow Factory.

'Shadow Factory is a B2B virtual, augmented, and mixed reality production services company." taken from shadowfactory.io

The challenge was to make a cool gameplay experience that allows players to move around a space without the restriction of cables. Specifically, we were given some cool new toys to help us meet this challenge. We have the Omen X Compact computer, which is a PC that straps onto a backpack contraption, so you can literally carry your computer around. Therefore, the headset can just be plugged into the player's back, and the player is not tethered to any specific location. We also have the Zed M camera, which is a camera that can sense 3D spaces and depth. Therefore, although we have a pretty cool setup and new fields to explore, we also have a couple of unique design challenges to solve.

A diagram showing all the new technology we were given, and how they all connect together.

Our core game pillars are movement, asymmetrical gameplay, and full utilization of mixed reality. Our current game idea is temporarily codenamed Effervescent, where two players play as a young spellcaster and a spellbook keeper who work together to defeat evil monsters. The spellcaster will describe parts of the monster to the bookkeeper, and the bookkeeper will search through the spell book to find the proper spell the spellcaster will use to defeat the monster. The spell caster will also have to continually cast location based defensive spells to ward off its attacks.



We've done a lot of designing...like...a lot.

When I'm writing this, we actually just decided on our game idea yesterday. We've focused most of our time so far on understanding the tech, so we know what it can and can't handle so we can design for the technology we have. Therefore, we don't have that much in terms of art or art progress, since we're still on the design stage and haven't started production yet. However, we do have an art direction.

For our art direction, we decided to go with a cartoony, low poly style that focuses on bright colours. For Mixed Reality games, optimization and frame rate are extremely important, so we decided to optimize our models and art style based on that.

A mood board we put together to show the art direction we want to pursue.

One thing we wanted to make sure of was that our game would have little to no characters and character animations. While I've done some 3D modelling before, character modelling, rigging and animation is still something that I have very little experience in. Not to mention it takes a ton of time, so we agreed to keep the characters to a minimum. Another thing we wanted to make sure of was that the in-game shadows wouldn't juxtapose against the shadows in the real world since our game is in Mixed Reality. Therefore, we're keeping the textures to mostly flat colours with no shading.

In conclusion, I'm very excited to see how our project will turn out. Never did I think that I would be doing a design challenge for a "client" for my capstone, but I am grateful I did because it gave us the opportunity to explore so many new things. I'll continue to update this blog as I go 🙂

NOVEMBER 7, 2018 BY JAMES PRATT

Devlog #2 – Designing virtual interactions in a physical space

Hey you! Last week, I talked about our design challenge and phrased it a bit like this:

> *How do you design an engaging and immersive game world using the real world around you?*

This challenge guided us throughout our early production stages and gave us something to look back at if we found ourselves stuck on a particular problem.

One of these problems was arguably one of our more interesting features.

One concept that went pretty far into production was a monster hunting game similar to Keep Talking and Nobody Explodes. One player would be the hunter and could see the monster and attack it, while the other was the veteran and knew how to defeat the monster based on a manual we'd give them. We tested the concept and found success in making it fun an engaging, but we hit a practical problem; what's stopping people from playing this game on their own. MR lets users see the game on top of the real world, so one issue we found was that the player fighting the monster can also just hold onto the manual and fight the monster. Another issue we ran into was that for the non-MR player, fighting a monster is more fun than reading a book so is it actually fun to be the non-MR player. The team knew we had to rethink things and during one of our meetings, I proposed something to the team:

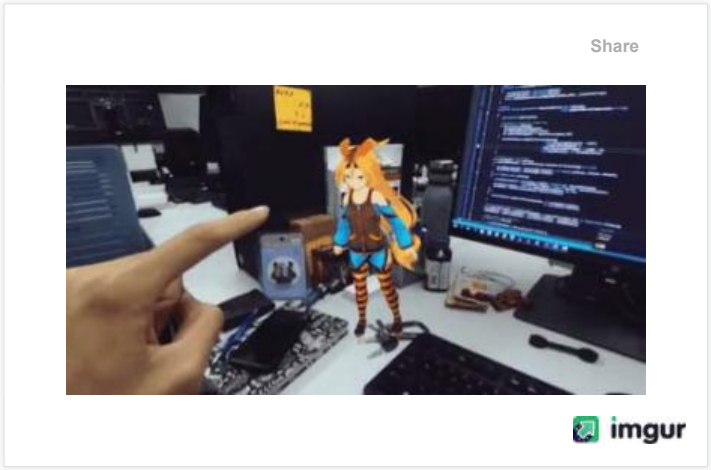
Instead of fighting the monster, what if you were caring for it?

Prior to this meeting, we had talked to our contact at Shadow Factory, Keiran Lovett, and he suggested we should focus on UX. We took this to this meeting and tried to step away from mechanics and goals. The intention was to make the game feel more like a sandbox experience where the focus in more on emergent gameplay as opposed to set rules and win conditions, which is when we landed on the monster pet care game idea. We eventually iterated it further so that the monster turned into multiple spirits, or will-o-wisps, that the player can interact with and play with.

Despite sounding pretty simple, this decision was actually incredibly difficult and came with its own risks. At this point, we were far into the semester with a playable alpha looming over us 6-7 weeks away (not including a week where the majority of the team would be in Montreal) and changing our game could prove to be incredibly risky. We had a couple of arguments, long awkward silences, and debates over Naruto characters but in the end, we made the call and went forward with our plan to change our concept.

So was it a good call?

It's certainly too early to say, but the project's been making considerable progress from that meeting to the time I'm writing this dev log. From that point, we managed to do a bit more testing with the new concept similar to our early testing, including some digital prototypes like the one seen here.



One early parameter we set for ourselves when designing for this game was:

The spirits need to feel like creatures and not objects

What this means is that the spirits need reactions to player interaction. We want to sell the player the idea that when they put on the headset, they are viewing an unseen world that exists on top of our own. In order for this narrative to work, the creatures that reside in this world need to feel alive and responsive. This parameter has helped our design processes and what interactions the player can take with the creatures.

As I mentioned, our playtesting style is very similar to what we have been doing before. Testing this way is effective because our interface **is** the player. We need to design a game that makes interactions feel as natural as possible. By doing physical prototyping, we are bound to real-world concepts such as physical space and gravity, grounding our design ideas to them. With that being said,

How do you prototype ghosts?

As far as I know, ghosts aren't real, and if they are I'm not sure how to acquire them for playtesting. However, balloons are real, and ribbons are real, so combine the two and you get:

Okay, so it's not perfect, but it did get us the kind of movement we wanted for the wisps, which looks like this

Cool! Now we had an idea of what kind of game the player would be taking part in, the important question that would follow would be what interactions are fun to do with them?

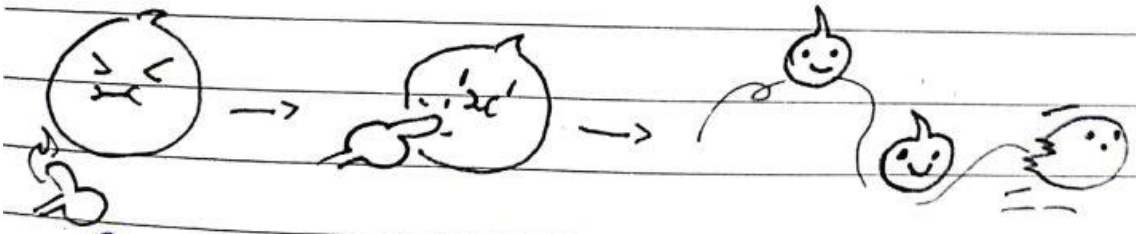
Smaller wisps → bigger wisps

appeal would come from juiciness

- lose some as you merge
  - adjust spawn rate

Poking to make smaller wisps + inflating

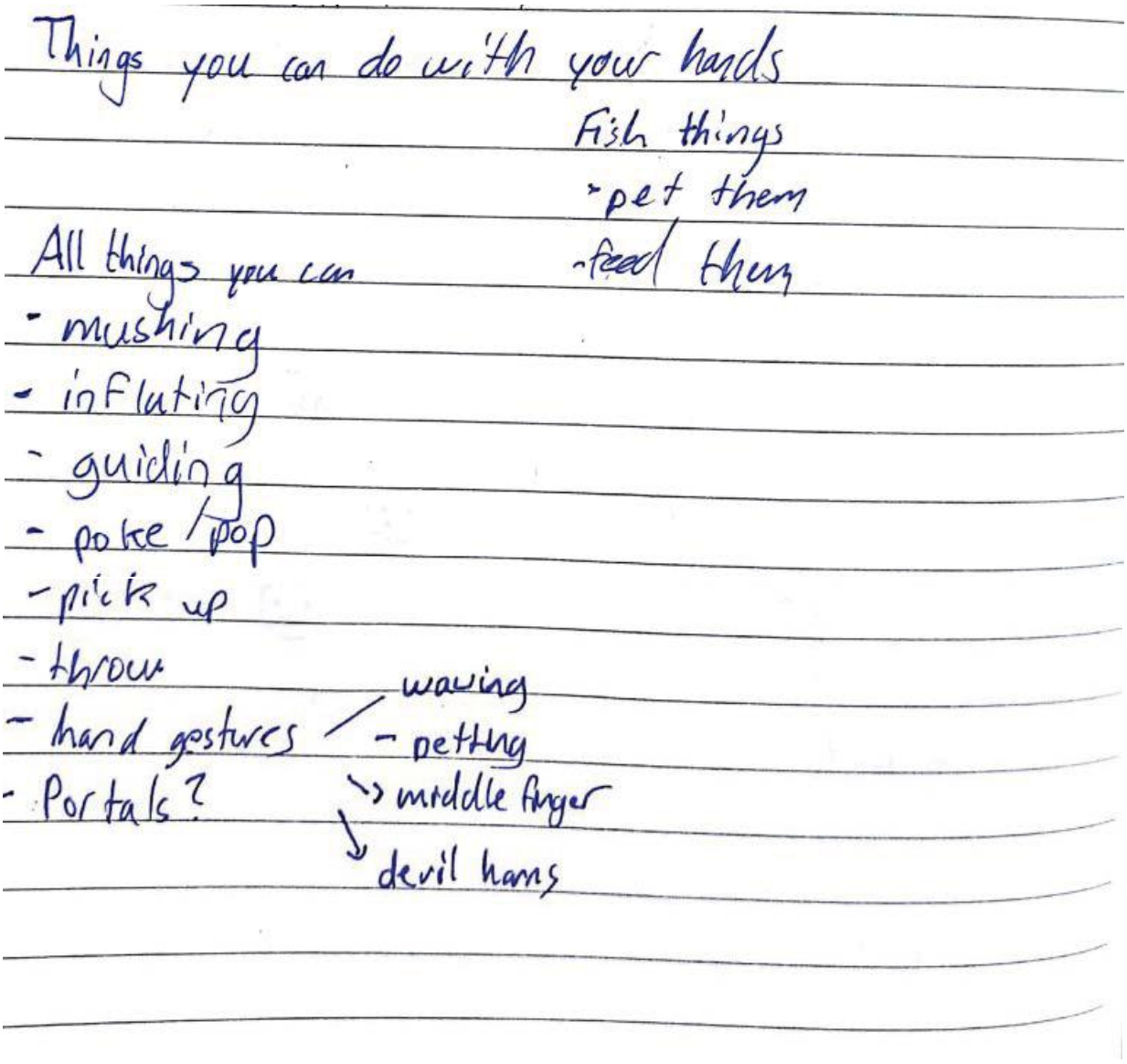
- deflating wisps real cute
  → while blowing away they make wisps



Drawing path

duration of path

- extra work for interaction that might not be worth it
- guiding with finger is way more fun



Me and three other team members sat down and brainstormed a list of ideas we would like to explore, which I later transposed into a chart in our GDD that looks like this

Interaction chart

Player Action	Creature Reaction	Facial Expression	Expression Duration	Sounds	Sound Duration	Progress: Planned	Progress: Tested	Progress: Implemented	Last Updated	Notes
Player isn't interacting with the creatures	By default, creatures will float around the player aimlessly until interacted with.	Neutral	Until they are interacted with	• Squeaky Purring	Until they are interacted with				11/6/2018	• Sounds for **Idle** should be a list of different sounds to draw so that they make constant sounds but also feel alive
Player grabs creature with hands	"Grabbed" creature position will follow players hand that is grabbing them	Surprised, then Neutral	3 seconds						11/6/2018	
Player throwscreatures that they are holding	Creature will quickly travel in the trajectory player threw them before correcting themselves.	**Surprised,** Angry, Sad, Joyful	Surprised: Duration of them being thrown Reaction: 3 seconds						11/6/2018	
Player pokes a creature with their index finger	• Smaller creatures will wince/be annoyed when being poked • Bigger creatures will pop when poked, creating two more creatures	• Smaller: Annoyed, Angry • Bigger: Scared, Surprised, Relief after popped	Smaller: 2 seconds Bigger, scared: While finger is done to creature During popped (surprised): 1 second After popped(relief): 4 seconds						11/6/2018	
Player moves their hand while pointing with their index finger	Creatures will move around the space, following the position of the index finger as the player moves their hand around	Curious, Joyful	Duration of interaction, swaps between the two						11/6/2018	
Player grabs two creatures and pushes them together	Creatures will mush together and become a single larger creature.	Wincing, then joyful when merged	Wincing: while they are being squished Joyful: 4 seconds						11/6/2018	

Where we are now

Officially we are out of pre-production and production is in full force. We currently have some digital prototypes and we received equipment that allows us to have the freedom of movement we want, so we should be testing that very soon.

As for our next steps, we are looking at exploring more interactions with the wisps and producing digital prototypes we can test externally. We plan on going to malls and testing there. As of now, our artists are currently working on first passes on the creatures we have tested externally with students at the school.

NOVEMBER 7, 2018 BY JENNIFER STIENSTRA

Prototyping, Playtesting, and More Prototyping…

By Jennifer Stienstra

Our main challenge for this project was how do we create an engaging and fun experience that uses technology that allows complete freedom of movement. One of the biggest sub challenges associated with that was, asides from having to learn how unfamiliar tech worked, was what we wanted to do with it. With weird and cool possibilities that the tech provided for us, we changed direction several times. At one point we considered a spy game, at another point we considered an asymmetrical multiplayer game akin to *Keep Talking and Nobody Explodes.* Our group didn't have a settled game idea until week 7/8.

But this doesn't mean that we weren't doing anything, or that we were directionless throughout the first half of this semester. During that time, the entire group went through multiple physical prototyping sessions, focusing on different things. What mechanics encourage movement? It's one of our core pillars after all? What mechanics utilize the leap motion? Drawing spells is a good example. What if we have a game with multiple players? Should it be multiplayer or single player?

Going in all of these directions might seem disorganized at best. But there was a method to the madness. Trying out all these different possibilities in physical prototypes helped us to figure out what was fun, what we liked, and what we wanted to continue with moving forward.

Physical Prototyping is Crucial

Physical Prototyping was certainly not undervalued in the first several weeks of capstone. It gave us the chance to quickly try out different mechanics and potential ideas without fully committing to them. Had we done digital prototypes, which are more time consuming, we would've been more likely to try and stick with the mechanic, even if there could've been other mechanics that would've suited the game better. The reason for not going to digital prototypes after one or two physical prototypes is that it allowed us more freedom to experiment a wide variety of different mechanics and think about which ones we liked and worked and which ones would be scrapped.

Constantly prototyping allowed us the freedom to go through completely different directions of tackling our main challenge. At one point we thought about having fast-paced gameplay and forcing players to complete objectives, the mechanics varying with each test run. Then we thought it'd be cool to have asymmetrical multiplayer, with both players doing different things to accomplish the same goal.

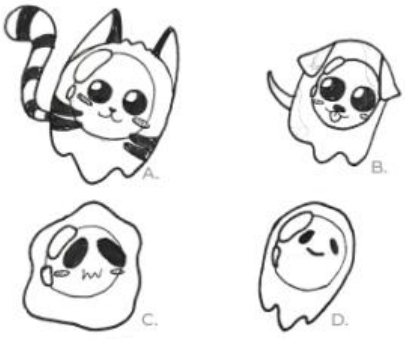
An important part of our prototypes was capturing the perspective of the player

Through our various testing, and the advice of mentors, we came to the conclusion that we should be making user experience our primary objective, and decided to turn away from playtesting mechanics to simple interactions the players would be able to accomplish when interacting with an augmented reality. It was this change in direction that has led us to where we are today, which is creating an interactive experience in which the player can interact with floating creatures.

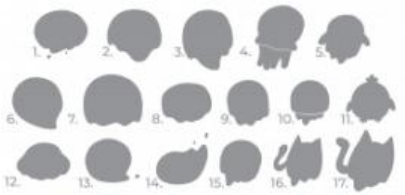
We wouldn't have gotten to this point had we not spent weeks doing physical prototyping before hand and figuring out what worked and what didn't before we moved to production.

Hurray We're In Production and Moving Forward! Now What?

Being in production, we know that means prototyping won't end just there. We now have a list of interactions that will soon be implemented in a digital prototype. However that doesn't mean we're done prototyping in general. Since we are heavily focusing on user experience, we're conducting external playtests of different aspects of our design.



We went around asking for people's opinions on the different designs like the ones above and below. This proved to give us valuable feedback we wouldn't have gotten otherwise.



Most recently, the art designers of the team created multiple concepts and possible silhouettes for the creatures the players can interact with, and walked around the school, asking for the opinions of students. We would ask them which features they liked and why, and also asked how they would interact with the creature if they ever saw one in real life. This provided valuable insight for our team, and helped to put us on a direction for the designs of the creatures.

Moving forward, we plan to continue playtesting and prototyping different aspects of the project in the hopes of creating the most excellent interactive experience we can make with our technology.

JUSTIN CAPCAP
Game Designer

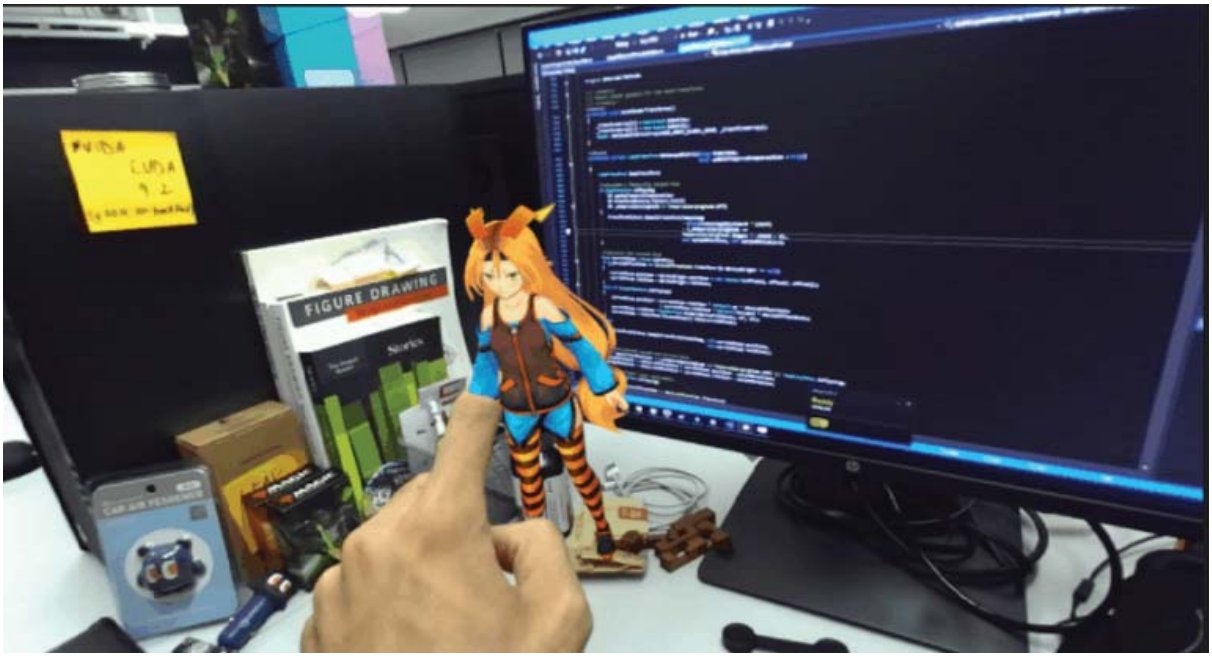
NOVEMBER 6, 2018 BY CAPCAP

Technical Dev Log – Moving to production

For this dev blog I'll mainly address the technical difficulties I ran into while playing around with our tech demo, particularly regarding depth perception of the zed mini camera that we're currently using for our project

Last week

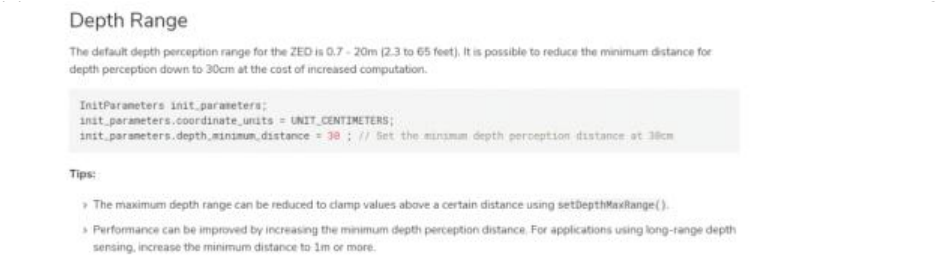
So from last time, we prepared a technical demo to showcase all the hardware setups we've been.



We noticed that there are instances where our hand would disappear. More specifically, the virtual game object would render on top of the hand.

After having our mentorship meeting with Andrew, we learned that there is a depth perception range to the zed mini camera. This range determines whether the camera can calculate the depth difference between the objects in sight. So if an object were to exit this range, the camera would get confused in regards to occlusion. Which is exactly what was making my hand disappear.

Looking through the Stereo labs api and the zed manager script in Unity. I was able to find a way to set the minimum depth… However the minimum distance can only be reduced up to 30 cm. This means that if the player puts his hand directly in front of the camera, the occlusion will still get messed up.



Depth Range

The default depth perception range for the ZED is 0.7 - 20m (2.3 to 65 feet). It is possible to reduce the minimum distance for depth perception down to 30cm at the cost of increased computation.

```
InitParameters init_parameters;
init_parameters.coordinate_units = UNIT_CENTIMETERS;
init_parameters.depth_minimum_distance = 30 ; // Set the minimum depth perception distance at 30cm
```

Tips:

- The maximum depth range can be reduced to clamp values above a certain distance using `setDepthMaxRange()`.
- Performance can be improved by increasing the minimum depth perception distance. For applications using long-range depth sensing, increase the minimum distance to 1m or more.

Link: https://www.stereolabs.com/docs/depth-sensing/advanced-settings/

We're currently looking into designing around this problem. One of the solutions we have in mind is to strap the leapmotion sensor on the chest. But then we realized there may be problems when the user's head turns, but not the body. Another solution, which is currently our best bet, is to set a range in front of the user. This range is for checking if a virtual game object is too close to the player's face, and if it is, just don't render it in the camera. This way we can prevent any reason why the user would have their hands directly in front of the camera in the first place, since no game objects would be within that range anyway. Of course we still need to playtest this and see if it can actually prevent it from occurring.

This week

During the week, our team discussed multiple approaches to handling animations to display creature reactions. In the end, we concluded that we would be handling the body animations through either shaders or softbody physics. Since our character highly resembles a slime creature, we realized this would be the best approach for this project.

During our tech meeting with Andrew, he provided us with some really useful references that we can keep looking into (BLESS ANDREW). So for this week, we'll just have to play around with these assets and see what we can do with them for now.

KEANA ALMARIO
Hexabyte Games

NOVEMBER 9, 2018 BY KEANA VICTORIA ALMARIO

Devlog #2: Designing a Poke-Inducing Creature

First pass of a creature mockup. Big spoilers for the content of this post!

For the past month, we were met with "I… still don't know what your game is" comments. And at that time, we were still looking at each individual interaction we wanted to explore. Those comments stop today*, because we've finally decided on our game!

This week, we also took a step back from designing the mechanics around the theme of the game. Through our mentors' advice and external playtesting, we learned to **put our intended player actions and user experience rst**, before thinking about any visual concepts — such as character art.

**by today, I mean last week.*

Deciding on the 'game' – finally!

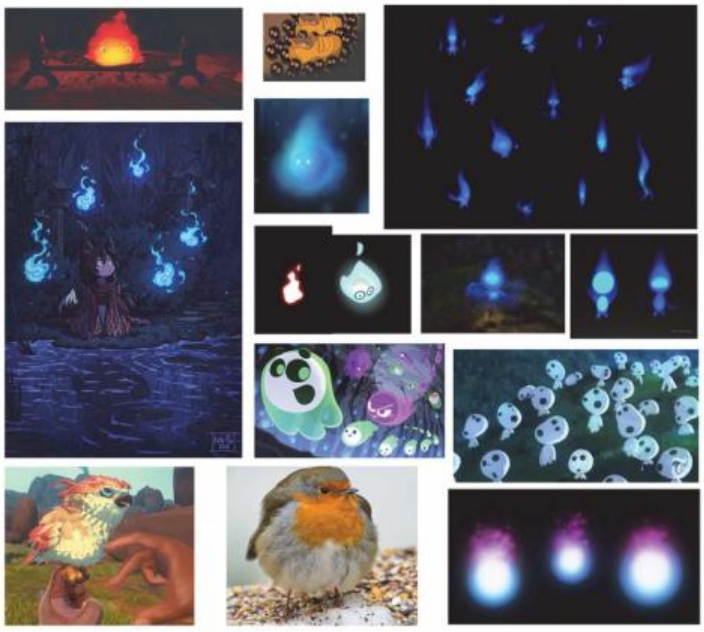
You, the player wearing the Mixed Reality headset, can see floating creatures around you. Using the Leap Motion camera attached, you can poke, pick up, and throw these creatures — all with your bare hands!

Currently, our project is less of a game and more of an interactive sandbox experience. We really want to get that player-creature interaction right first before gamifying it, because we believe that the UX of unique tech like this should be the main focus of the project.

Realizing people don't play with fire

Will-o'-the-wisp by Kate-FoX. We initially used this drawing as reference.

At first, we were thinking of **will-o'-the-wisps**. These creatures had the perfect magical feeling we wanted to convey. We wanted to focus on blobs of fire. We also wanted there to be a consistent base body, with a fire shader around it that would vary in size, shape, and proportion.



Initial moodboard. Sources: various.

We then realized (thanks to our art mentor) that the problem with will-o'-the-wisps lay in the very core of their design: they were little balls of fire. The first instinct of most people is not to play with fire. Using the ghostly, fiery likeness of will-o'-wisps would go directly against the core of what we hoped the players would do: poke it.

"Ok time for me to bother this animal"

Since our focus was on player interaction, we wanted to zone in on the interface between the player and the creature: we wanted to think about that moment the player's finger 'touches' the virtual creature, and the feedback from it. Instead of focusing on the magical aesthetic of the game, **we decided to focus on the *feel* first.**

The questions we asked ourselves the most during this phase were:

- What *feels* good to poke/squish?
- When do people have a difficult time resisting the urge to poke/squish?
- What would that look like?

For reference, we used this very handy image:

A funny image shared around different social media platforms.

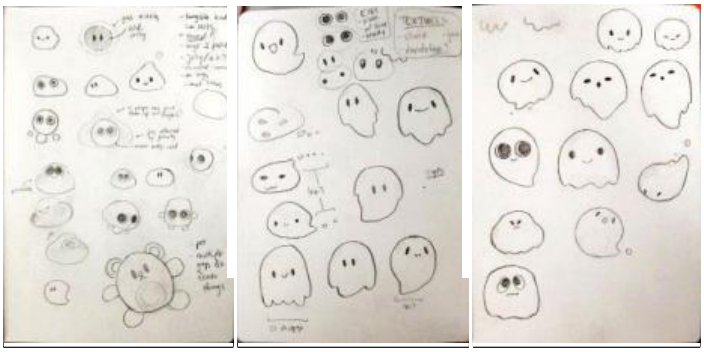
Sure, the picture doesn't accurately answer our questions in context of the game. We didn't want floating animals, and we didn't want to have any fur to render in a Mixed Reality headset. We still learned some interesting things from this picture alone (and further research):

- Soft and reactive things feel good to poke/squish. Textures include fur and solid jelly-like objects (like stress balls).
- People have a difficult time resisting the urge to poke/squish round and soft objects. This would include cats and fat cheeks.
- This would look like… really cute jelly balls with faces. Or the dumpling kid from Pixar's short film *Bao*.

Sketches, Silhouettes, and Mockup

From our research, I decided to try out **some sort of jelly ghost blob**:

- **Jelly** to account for the expectation that it'll bounce when you poke it (good feedback!)
- **Ghost** to justify the creature floating around you
- **Blob** to facilitate the urge to poke (round and soft characteristics).



We compiled a variety of different silhouettes and showed them to different students all over the school:

Silhouettes.

We found that people liked silhouettes with pet-like features (chick, cat) because of previous associations with cute animals. They also liked the silhouettes with smaller blobs floating behind them, because of the sense of movement.

I also made a mockup, playing with the color and opacity of one the designs:

First pass of a creature mockup. It's the spoiler I was warning you about!

Going forward…

We're currently pretty happy the track we're on. The creature design isn't perfect yet, but we want to spend the next week iterating and testing on it. Our mentor pointed out that the shape and opacity of the creature looked like it was *goopy* instead of *bouncy*, so we want to iterate a less runny-looking material. We're also planning to play with the opacity of the creature, making it look more solid+bouncy than runny/gooey.

ART, DESIGN

November 06, 2018

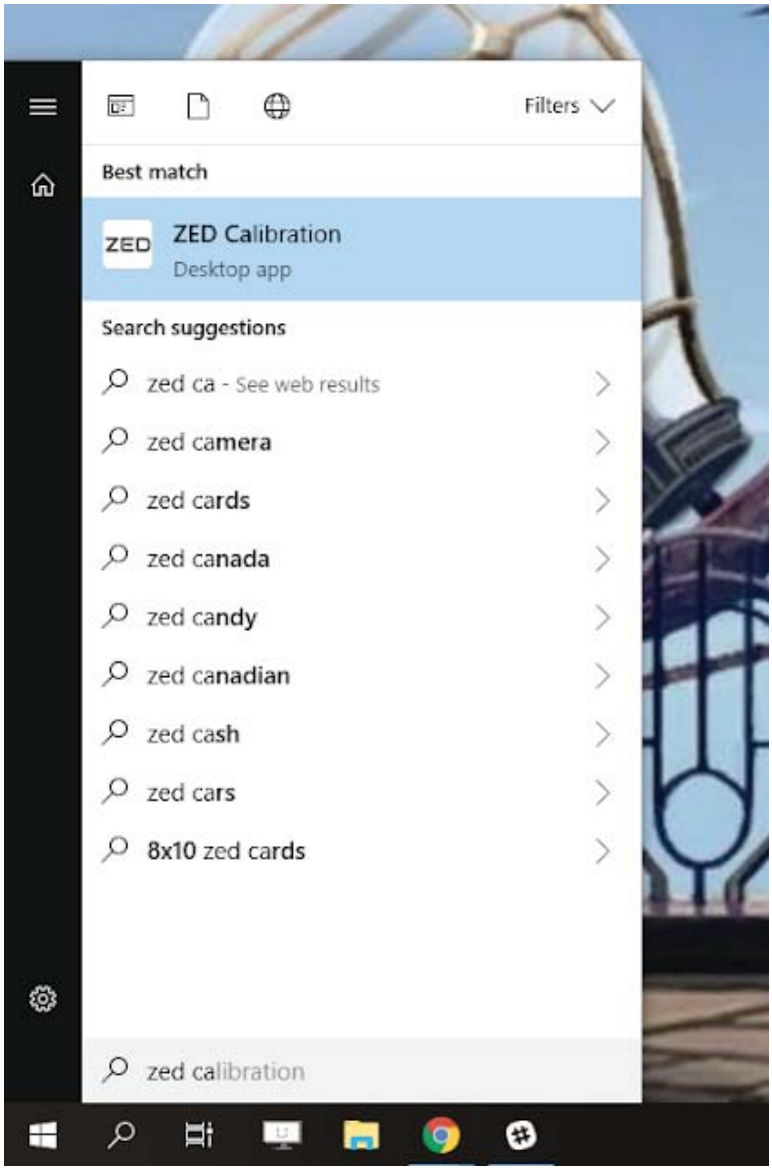
HOW TO SET UP THE ZEDM CAMERA AND HP WINDOWS MR HEADSET IN UNITY

—

So last time we went over all the stuff we're using for our fancy AR project, and having the technology is one thing but getting it working is another thing entirely. The most trouble we had was getting the ZEDm Camera to not crash and getting projects for the HP Windows Mixed Reality (HPMR) headset to build. So here's how we did those things.

Setting up the ZEDm should be pretty straight forwards. Download the latest SDK and you should be good to go, but we still ran into a few issues. Now to be fair we were working with version 2.6 of the SDK and since then it's been updated so you might not experience the same problems that we did.

The silliest problem we ran into was simply not calibrating the ZEDm. We have multiple machines, and going between them sometimes we would forget to calibrate the ZEDm. This is a simple fix, but it's also easy to forget if you're moving from one machine to another.



The first real issue we had was with NVIDIA CUDA. The ZED Camera requires CUDA to work properly, and when you install the SDK it will install CUDA alongside with it. However the CUDA installer that was included with the ZED SDK would fail, and we would have to download the installer for CUDA separately.

At the time CUDA 10 was the most recent version, which the ZED did not support yet. After we realized this we went back to CUDA 9.2, however we found that there were issues with having multiple versions of CUDA installed. When we had CUDA 10 and 9.2 installed at the same time the ZED couldn't detect either of them, and this problem was only fixed once we uninstalled the other version.

The last issue we ran into was that in builds running on our target machine the ZEDm would crash after a few minutes. I understand that this has been fixed in the latest version of the SDK, but in order to get around it we had to downgrade our graphics card drivers to an older version.

The HPMR Headset is fairly simple to set up as to my understanding everything you need to get things working is included with all versions of Windows 10. Once you plug in the headset the Mixed Reality Portal will automatically boot up and walk you through calibration and setup. At the end of it you'll find yourself in a house that works as a sort of VR desktop. Getting into the house isn't hard, it's getting out that's the tricky part.

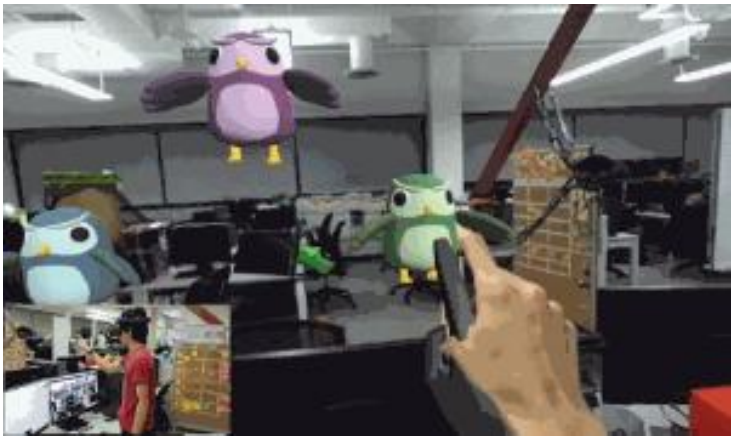
If you look up how to make a build for Windows Mixed Reality in Unity you might find this page from the Unity documentation. It goes over making a Universal Windows Platform (UWP) build and how to run the Visual Studio Solution that it spits out and so forth. If you've only ever built .exe's then this can be a pain to wrap your head around, but thankfully it's a pain that you don't have to worry about!

As I went over in another post, Windows Mixed Reality is actually just a fancy brand name for all of Microsoft's headsets. This includes things like the HoloLens which I guess is where they got the idea to call everything Mixed Reality. Regardless the HPMR Headset is actually just a regular VR headset with all of its sensors built in.

DON'T BE FOOLED, THEY'RE JUST VR HEADSETS

So instead of making a UWP build you can make a regular old exe. In fact, when we were working with the ZEDm it was incompatible with UWP builds, and we had to instead make .exe builds and run through SteamVR to get it to work. Using SteamVR with WMR headsets requires you to install a free tool from Steam for it to work.

One last thing is that when we were using the SteamVR plugin for Unity we had to use an older version, as something wasn't playing nicely with our setup. I forget if it was the ZEDm or the Leap Motion or some other tool, but if you run into issues with the SteamVR plugin the older versions are available for download from from Valve's github. The issue we had was specifically dealing with controller inputs, as I think one of our plugins was built with an older version of SteamVR.



Anyway, after all that everything is finally working. If you run into any other trouble with the ZEDm Setreolabs is really good with troubleshooting and support. They would often respond to our messages the same day, and they were always helpful so if something isn't working and google doesn't turn anything up so don't hesitate to send them a message.

DEVELOPMENT LOG OF YANI WANG

A place for me to document my experiences being a game designer and 3D artist.

NOVEMBER 9, 2018 BY YA NI WANG

Development Log #2

Since the last time, a lot has happened in our capstone group. We've solidified on our game and we've completely changed the direction that we were pursuing. Something I was really thankful for was that my capstone group has enough experience designing games that we've exercised caution – we were careful to not fall in love with our previous game ideas so it didn't hurt when we scrapped the whole thing. Also, it allowed us to view our idea objectively and see it in its entirety: flaws and all.

This change was basically triggered by the first meeting we had with our contact at Shadow Factory, Keiran Lovett. He mentioned that user experience is basically the most important thing for our design. He also mentioned that user experience is thought of almost like the last point in any game focused design and that the fact that we had this technology to use was an important thing to think of.

What our technology looks like when it's on, more or less. We realized putting it on and strapping it in was a commitment on its own, and that many 'non-gamers" would be intimidated to even wear it.

Needless to say, we had a super long internal meeting purely on UX, and we thought of a lot of points. Based on research, we've decided that the funnest part about Mixed Reality and our technology is just the juxtaposition and amazement of seeing "magical" or "mystical" things in real life, such as the Pokemon Go AR feature. Therefore, we've made lots of progress on general design wise. We really wanted to make this an enjoyable experience that focuses on mobility, hand motions and the magical factor of seeing mystical creatures in the real world. Our game is about interacting with the "creatures" and as of right now, it's very much based on emergent gameplay. We are focusing on making the interactions between the player and the creatures fun for our minimum viable product, and if that is achieved, then adding additional features that enhance our experience.

Art-wise, we've certainly been busy. Keana and I have been wracking our brains to come up with a design for our mystical creatures. At first, we wanted to go in the direction of will-o-wisp like creatures with cute faces on them because we wanted them to seem natural when they float in the air – we didn't want something like a puppy or kitten because it would seem weird to have them floating around.

The style of will-o-wisps that we wanted to emulate.

However, after a few art meetings and mentorships, we decided to change our direction. Our art mentor, Jon, mentioned that wisps looked a lot like flames and that players might not want to touch them at all. And if they did, they would mainly try to cup them – it didn't really aid the interactions at all. And that was the core of our design challenge for the creatures – we wanted the design of the creatures to facilitate the interactions. We looked a lot at family pets – what about a cat or dog makes you unable to walk away from one without petting it? What makes a cat's belly so unresistable – even if you know you'll get an armful of claw marks for it?

Our most essential art inspiration, believe it or not.

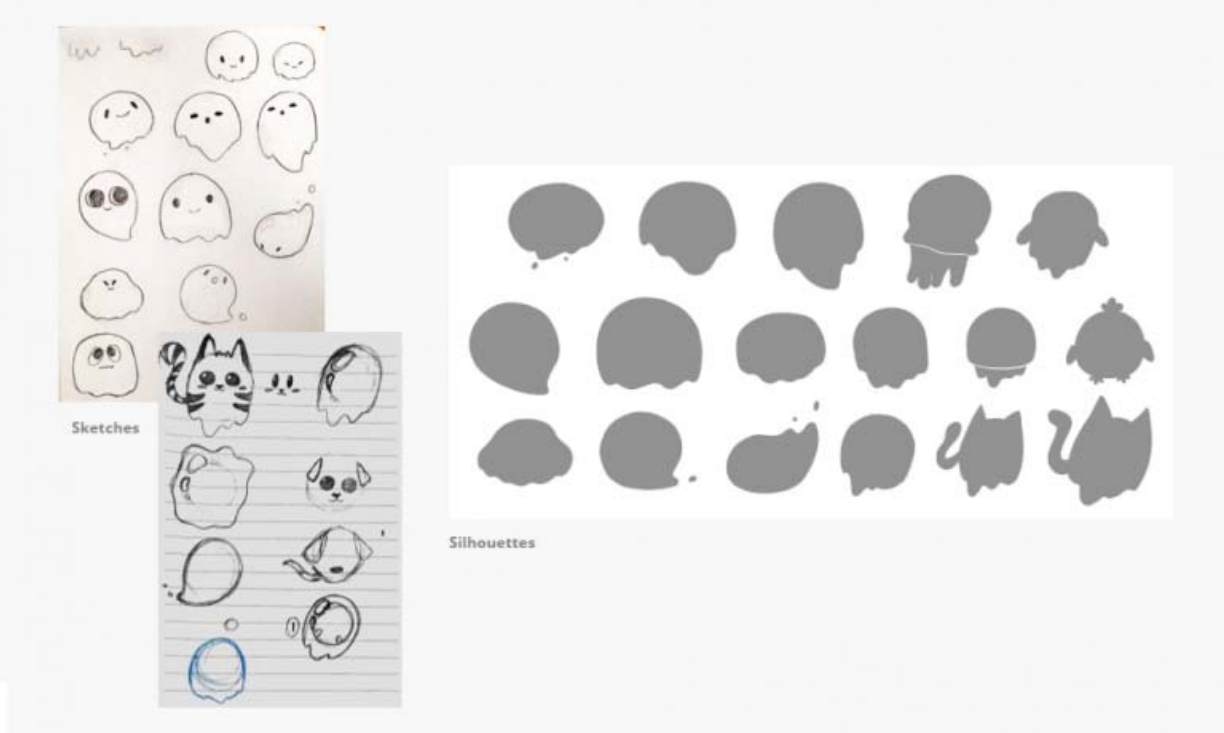
Between balancing that and the limitations of our technology have been a challenge. Many reasons why cats and dogs and other creatures seem irresistible is their fur, and we can't exactly mimic that. We can't simulate the haptic feedback, for one, and not to mention that fur is incredibly expensive to render.

And that brings us to our next idea, Slime Rancher. Slime Rancher is a game where you raise and nurture little Slimes, and then suck them up and farm them for profit. It's a tycoon/farm/cute pet game, but the most important part is the design of the slimes.

Some slimes from Slime Rancher. As you can see, aside from there being variations of their designs, they're also incredibly cute.

The slimes were cute and looked interactable – we got the irresistible urge to poke and jiggle them, while also wanting to feed and pet them. Since they were also slime, they also would solve the problem of lack of fur and haptic feedback. This is what our main source of inspiration came from. From there, we started designing and testing.

We came up with a variety of silhouettes and designs, and we compiled them together. It was interesting to see Keana and I's difference in direction. We had decided to work on them separately so we wouldn't be influenced by each other's design decisions, and therefore we went in totally different directions. I tried to incorporate familiar creature features in my designs, such as designing blobs with cat or dog ears and tails, or blobs with small wings and snouts. I thought that the familiar features would help players feel at ease and also give them the familiarity of some interactions – they would know to scratch the ears or boop the snouts. However, Keana went in the opposite direction and tried to make the slimes as featureless as possible, just a blob with a face. We both brainstormed together after and compiled some designs:



What we ended up with – silhouettes and a variety of designs. These were what we tested.

Then, we gave these designs to our designers, James and Jen. They took these around and showed them to a variety of different people at our school – they went to common areas and tried getting different peoples opinions and first reactions on these designs. The art testing helped a ton and we got a lot of good feedback – overall people liked a more "dynamic" silhouette, and they also preferred a much more simplistic look to the creatures themselves. A lot of people didn't actually like my cat or dog designs because they said it was too "busy". And thus, this is what we decided on so far:

Simplistic, blobby and cute – so far everything we've been going for.

The final creature design is probably going to end up drastically different from this, but for now, I'm excited with what we have and I'm looking forward to what comes next!

NOVEMBER 30, 2018 BY JAMES PRATT

Dev Log #3 – Playtesting for feedback and usability in a Mixed Reality space

Hey you! So the last post I said that we reconsidered a lot of our original design choices and the process that led us to where we currently are at in the project. The project has a much more defined concept, which is:

> *A sandbox mixed reality pet sim where the player can interact with floating blobs by poking, petting, squishing and merging them.*

Our game is built around the idea of open exploration: we don't want to explicitly impose strict goals on the player. Instead, we want to present rules and interactions that the player can use to create their own goals. We currently have a pretty full list of possible interactions, but for the alpha, we only really want to test out three in particular: Picking up, Pushing/poking, and merging/splitting (I mean when I put it out like that, it's more like 5). The game is all about player experience, so we have to not only consider how these interactions will work but what kind of feedback it will produce when the player performs these actions. That's where testing comes into play!

For the last few weeks, our narrative designer and production manager, Jen, and I have been performing focus group tests with people around the school. Our goal has been to help the other departments on our team get an idea of what direction we should go based on feedback from potential users. Essentially, we have filled a bit of a QA role these last few weeks instead of design, but we both decided that it should be fine considering that the bulk of the design work for the alpha has already been done and getting early user data would be beneficial.

Preliminary Designs by Yani Wang

Silhouette Table by Keana Almario and Yani Wang

So what did we subject the poor souls of Sheridan College to in the name of SCIENCE!?! Well, first we did preliminary art tests for our art department. We want the creatures the players are interacting with to facilitate what you can do to them. Balancing that with our goal to always present these creatures as being alive as opposed to objects ended up being tricky. Like, really. How do we get people to squish, push, and smoosh creatures if we tell them they are alive? Our art team, consisting of Keana and Yani, drew up and produced this to help test designs with:

Using the mock-ups, we took my now-deceased laptop (R.I.P Lappy) to the halls of Sheridan and asked them what they thought. During our first tests, we found that most people liked the blobbier, less animalistic designs from the first page,

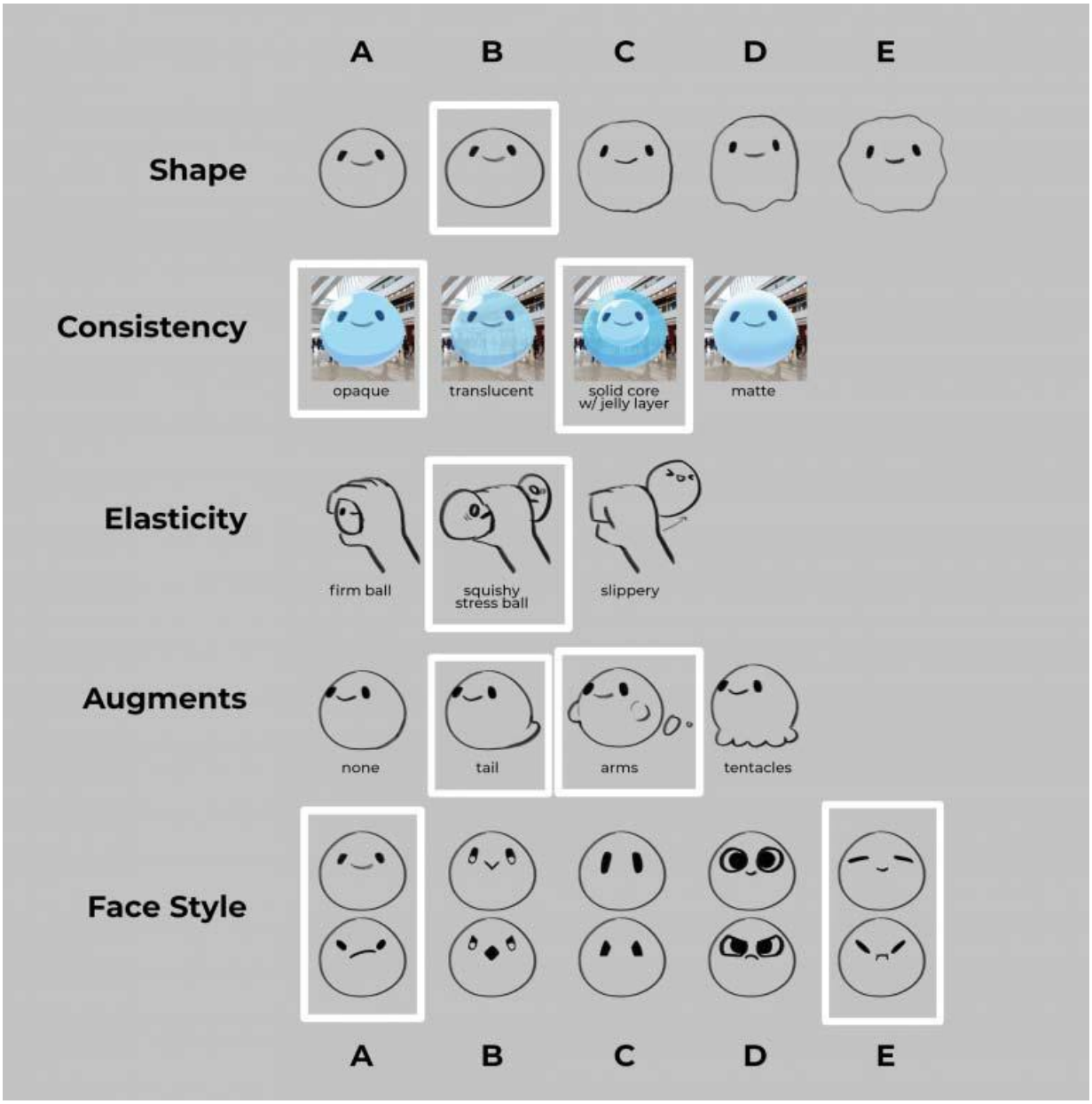
and found that people really liked N, C, and F for the second page. We took these results back to our art team so that they can use the feedback in further designs.

After that set of testing, me and Jen decided to do some “material testing”. I don’t think this could exist in any other environment than doing a mixed reality game, but we felt we needed to get good feedback to get a sense of how our blobs should respond to player interaction. In order to simulate these interactions, we bought objects that resembled the

consistency and material of the blobs we wanted to make and took them to school and asked what people thought. These toys included some slime, silly putty, play-dough and a stress ball

And no, we didn't add googly eyes while we were testing.

We found that the two most popular materials were the slime and silly putty as they were squishier and more fun to play with. Conversely, we found that the stress ball was the least favourite as it was harder to squish. Also, people mentioned they couldn't really see a creature with the same type of consisentcy as the stress ball as they were tempted to throw it instead of pet it. We recorded the data and gave it to our art team for review.



Art board created by Keana Almario

Lasty, we took another art mock-up sheet and went out to ask students what they thought about the designs.

The mockup was split into rows and columns and we asked students to pick which blob they liked an why. The designs with the white boxes around them were the most popular choices, as they were the ones that gave the most character. Oddly enough, we found that the arms on the blob were very popular, which seemed to contradict the first test where people favoured the more amorphous design. In the end, we came up with a final-ish design for the creatures which looks like this:

Visual Mockup by Keana Almario

So this is all well and good, but you're here for design? I like to think that testing is part of the design process. We want to make an engaging experience for players, and because of that, we have to be in tune of player reactions as often as we can throughout development. Also, as I said before, we wanted the blob's design to facilitate how the player can interact with it, making it just as much of a design challenge as an art challenge. Now, where do we go from here? With the semester wrapping up, we don't have much to do before the alpha comes out, but Jen and I would like to hit the ground running into the new year by prepping for a couple of challenges we know we're going to face into the new year.

To start, we currently have an issue where if the blobs get too big, they can clip through the players head. This causes the blob to disappear when it gets too big and the player picks it up. We've already discussed some possible solutions, such as having the blob burst if you feed it too many other blobs, but that's just one of the challenges we are foreseeing. Next post, I'll be talking about how we approached solving these challenges as well as some other cool systems I helped design.

NOVEMBER 29, 2018 BY JENNIFER STIENSTRA

The Importance of Playtesting for an Interaction Heavy Experience

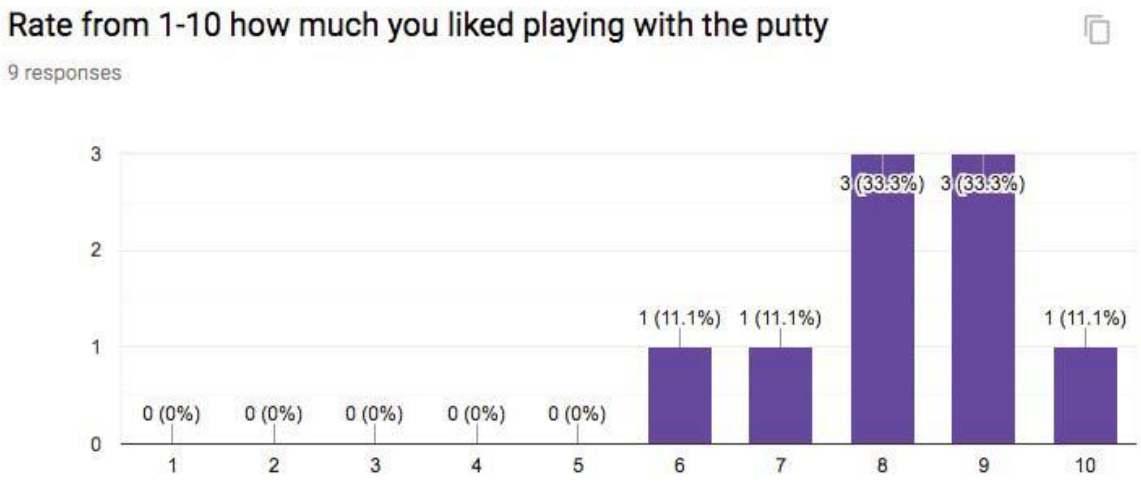
Our capstone project is primarily centered around interacting with little floating blobs that the player can find around them when they wear the headset. We came up with several interactions and mechanics for the player, such as picking them up, tossing them, and splitting them. However a challenge quickly arose. How do we let the player know what interactions they can perform with the creature without being explicit? This was something that needed to be addressed early on, as our mechanics center around interacting with the float blob creatures, and the last thing we wanted was to have a game mostly developed and realize that players didn't know what they could do with them.

A challenge our artists had that was tied to this was having to ensure that the character design facilitated the interactions and mechanics we wanted. If we want players to pull our creatures apart, or squish them, or merge two together, how do we let them know through character design that these are actions they can do? Our solution to this challenge was to conduct a series of playtests with the public. We approached people and asked them a series of questions, then went back to see if the answers they gave us matched with what we were trying to get people to do in-game. We performed two different playtests: one that tested different physical materials we were thinking about emulating for the creature, and another tested different features of the creature.

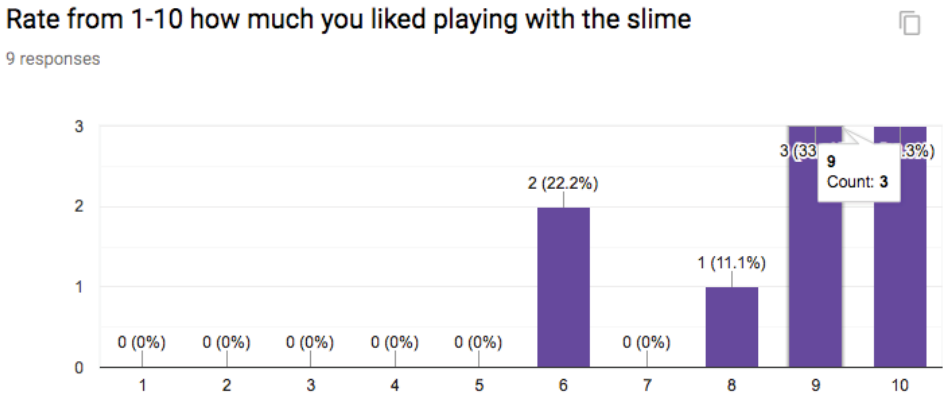
Playtesters are shown different potential features for the creature and give their opinions.

Material Playtest

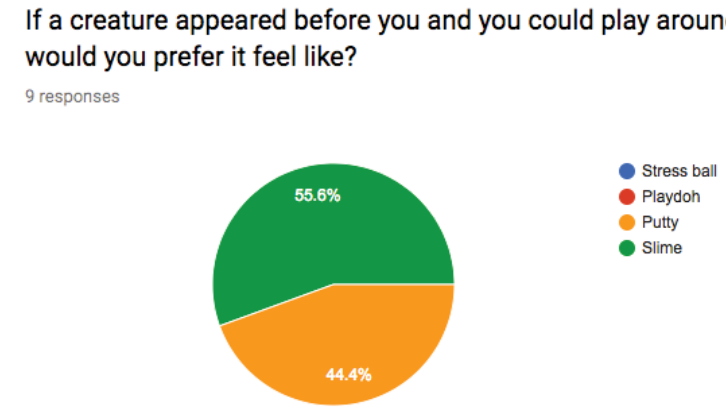
The goal of the material playtest was to see how people interact with different materials and determine which fits better with mechanics we're trying to reinforce. For this playtest, we gave the testers playdoh, a hard stress ball, putty, and slime. We wanted to see how people interacted with these materials as well as how they would react to a creature made of that material if one appeared in front of it. Our observations and test results showed that putty and slime fit our design better, as players would poke, toss around, split, and merge these two materials. Players also preferred playing with the slime and the putty over the stress ball and the playdoh.



Results of how people liked playing with the putty



Results of how much people liked playing with the slime



Results how of people would prefer the creature seem closest to based on the materials we gave them.

The results of this playtest would inform our team of how we should be designing the characters to encourage this interaction.

Updated Character Design Test

Following the materials test, we had our potential designs updated and divided up by different features. We walked around and asked for people's opinions and feedback with the appearance of the creature and why they like those particular features, and based on what we got helped us determine our final character design.

Conclusion

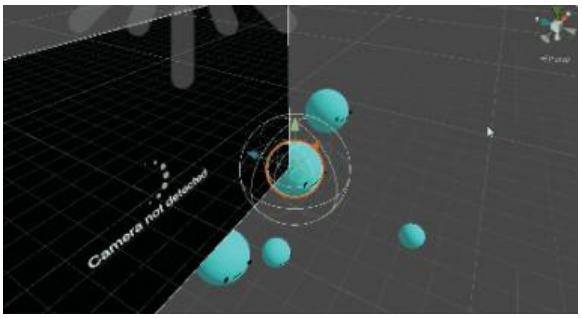
Playtesting and prototyping has played a huge role in our project thus far and that primarily because we are creating an experience where interaction with a digital creature is very important for us. Getting feedback and making observations has been absolutely critical in informing design decisions around the blob creature. It's been especially important for us to test different aspects of the creature, not just how it would look but how it would react (ie. its squishability) and how it would "feel". These things help to translate to users what they can do with the creatures without explicitly telling them what they can do. Playtesting early on different aspects of the creature and getting that feedback has helped us to know that we were in the right direction with our design.

JUSTIN CAPCAP
Game Designer

DECEMBER 3, 2018 BY CAPCAP

Technical Dev Log – Merging

For the past 2 weeks, I've mostly just been focusing on implementing the blob merging feature.



So far how it currently works is that merging is just triggered with collision. After collision, the bigger blob gets to "eat" the smaller blob. This just means an increase in scale and destroying the smaller blob. Destroying the smaller blob will eventually get refactored since we'll be implementing object pooling anyway, but for now we just left it as it is so we can start testing.

After playtesting, we found out some issues regarding the blob getting too large after eating too many smaller blobs. Some of these issues include the blob getting too difficult to pick up due to the oversize, clipping through the camera, and sticking to your hand because of their increased pick up radius.

Most of these problems we ended designing around it. One of our solutions was to make the blob explode after reaching a max size. Another one was just to reduce the growth rate of the blob so they don't expand to quickly.

Another pretty big concern we have right now is displaying feedback of the merging. Thank god for our technical meeting with Andrew this week, we learned about this Raymarching toolkit for Unity.

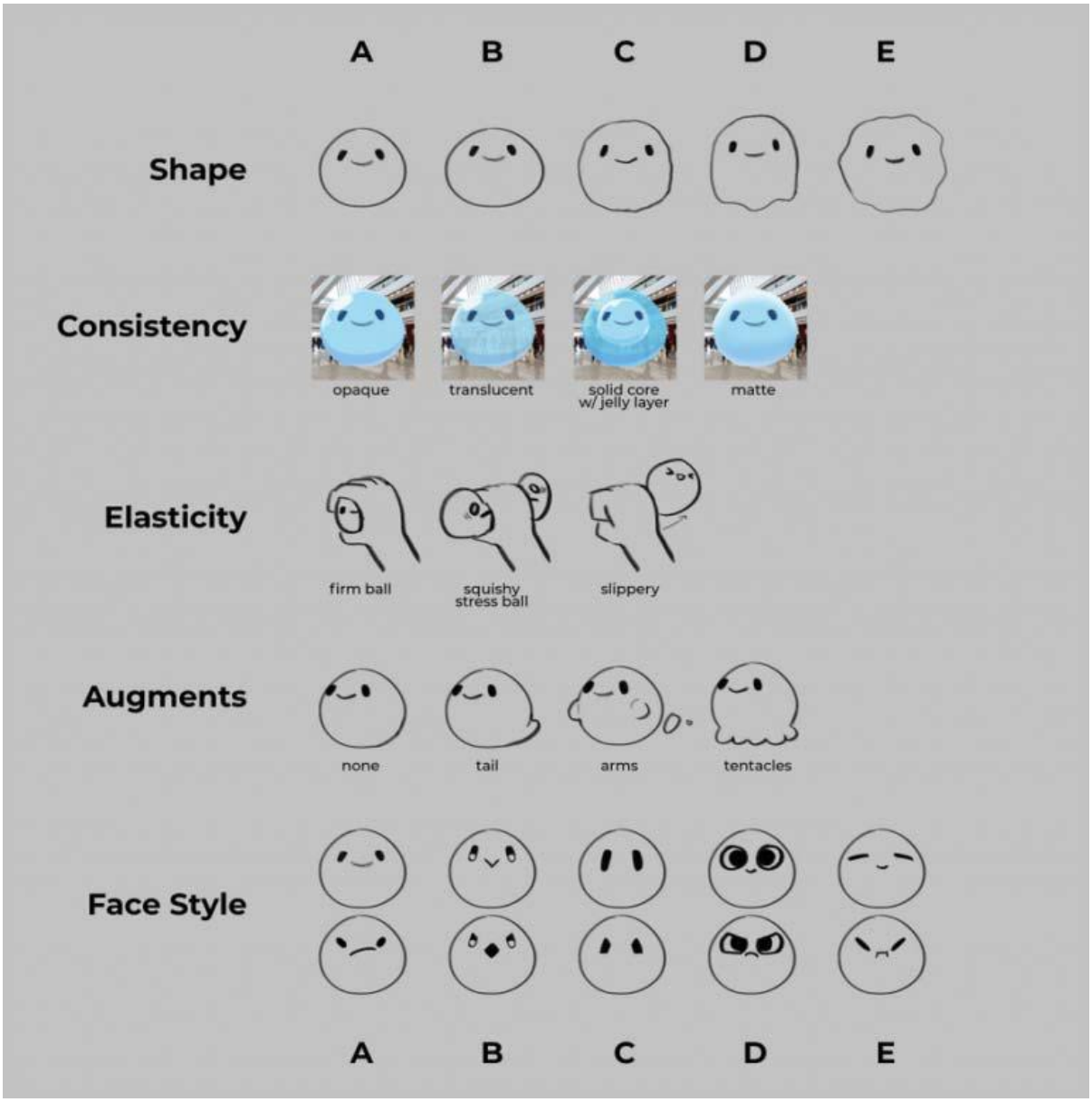
https://kev.town/raymarching-toolkit/

For the past few days we've just been playing around with Raymarching, trying to understand how it works. Another thing we realized is that implementing Raymarching will require the entire blob merging script to be refactored as well, which will be my task for the entirety of next week.

KEANA ALMARIO
Hexabyte Games

NOVEMBER 29, 2018 BY KEANA VICTORIA ALMARIO

Devlog #3: Converging on a Design



Different options for blob characteristics.

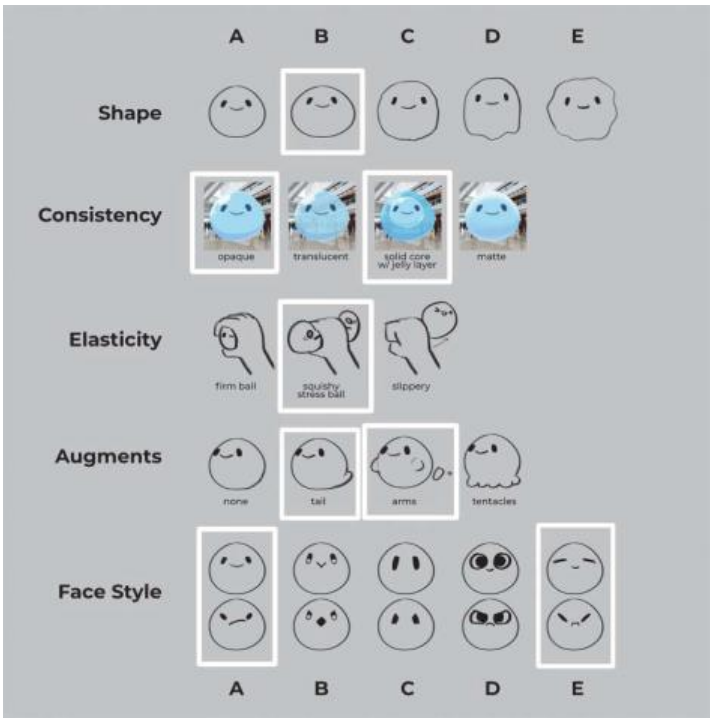
For the art team, this part of development was focused on testing, testing, and testing. We had created silhouettes and options last time, and for the longest time it felt that all we were doing were creating more options. This week, we were determined to finally stop keeping doors open, and finalized our design!

Testing with various options

Jen (not in picture) and James testing on our concepts.

To decide on how our blob should look like, we decided to test different aspects of it: shape, consistency, elasticity, augments, and face style. We had a general direction we wanted to go in, but we thought that if we knew which specific aspects people liked most and combined them, we could come up with a better design.

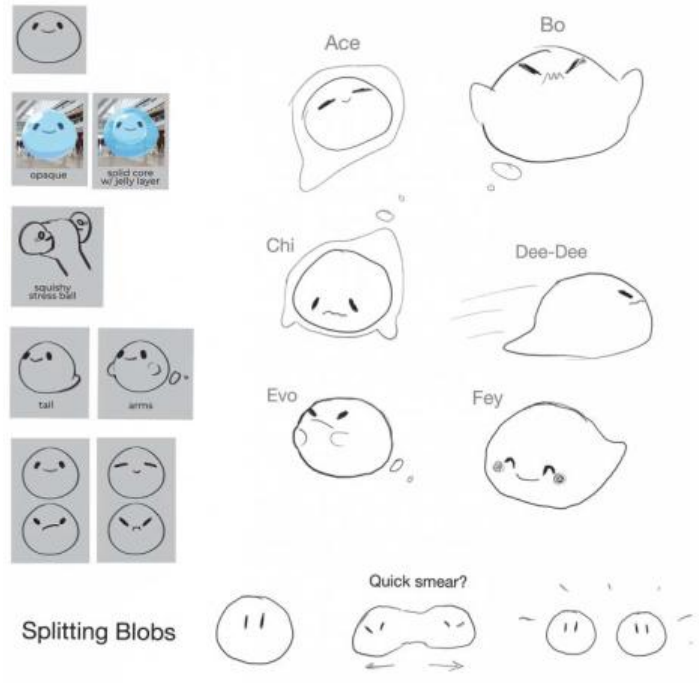
Here are the results! (insert drumroll)



The characteristics that the testers preferred.

We found that the testers liked the characteristics that implied more personality and movement.

Putting it together (and personifying concepts)



Concepts I drew up, mixing and matching the preferred characteristics.

After seeing the results, I mixed-and-matched the shortlist of characteristics into 5-6 designs. At first I labelled them from A-F, but I felt I was being too rigid. For this phase, I wanted the team to look at each blob like it was a friend or a pet, and see which one they felt the 'closest' to.

The answer? To name each of them! They aren't very creative names, but naming them gave my teammates a better sense of what the blob designs would be if it was a pet.

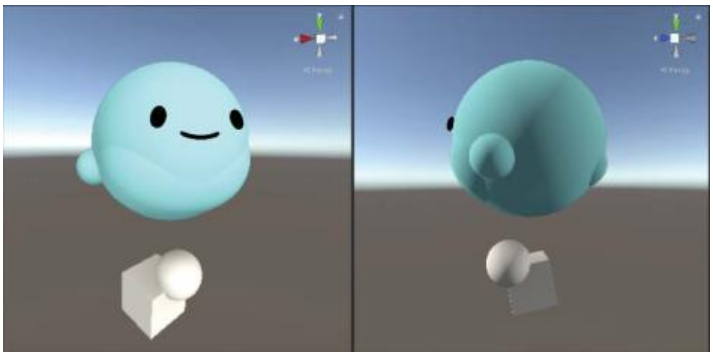
How do we animate 3D jelly smoothly?

When we first started thinking of how the blob would look and act in-game, the very first thought was, "How do we animate jelly?"

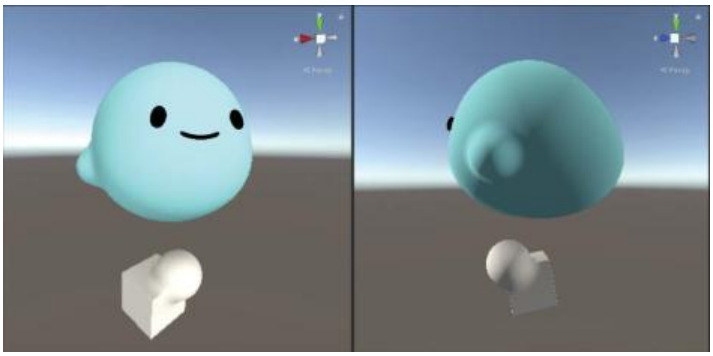
We considered several options:

1. Making the blob and rigging multiple spheres in Maya, while using a jelly shader we found on the Unity asset store.
2. Using soft-body physics in Unity.
3. Using Raymarching Toolkit with non-meshes that we had to animate in Unity itself.

We decided to go with the last option, especially because Raymarching makes the intersection between two meshes a lot smoother:



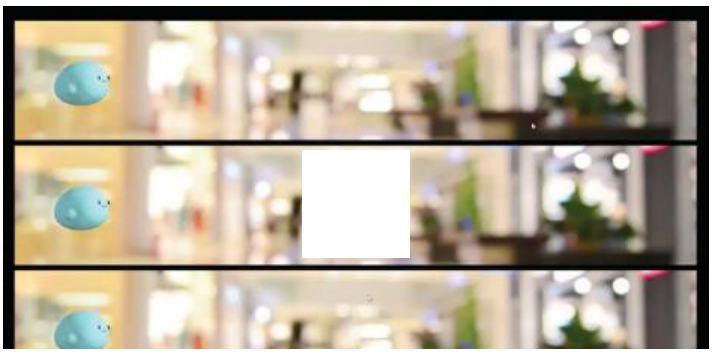
Without Raymarching.



With Raymarching! Look at that smoothness!

The interesting part about Raymarching is that all of this is done with math. In this scene, there aren't any *actual* meshes being made, but they're all calculated. This looks good so far optimization-wise, because too many meshes/polys can really add lag. However, we'll have to see how the game will hold up with a lot of these blobs flying around.

Since I knew I wanted this blob to have a 'tail,' I quickly put together a test and tried to make the blob's tail lag behind its body. By using Unity's spring joint to connect the body and tail and messing with how much it bounces, I was able to get a better idea of how blob movement might look like:



So far, I'm liking the middle sample, which is a middle-ground between solid and super-jelly. However, I want to look into seeing its readability in-game — maybe I'll consider using the last one since it's the most readable.

Going forward…

After deciding on the consistency and springiness we want for the blob, I want to test out basic animations with the blob's arms. Since it doesn't have segments in its tiny limbs (i.e. no elbows), I want to see the extent of its expressiveness. From this test, I will either have to make slight changes to the design — or look for a way to subtly add elbows without the blob looking really strange.

ART

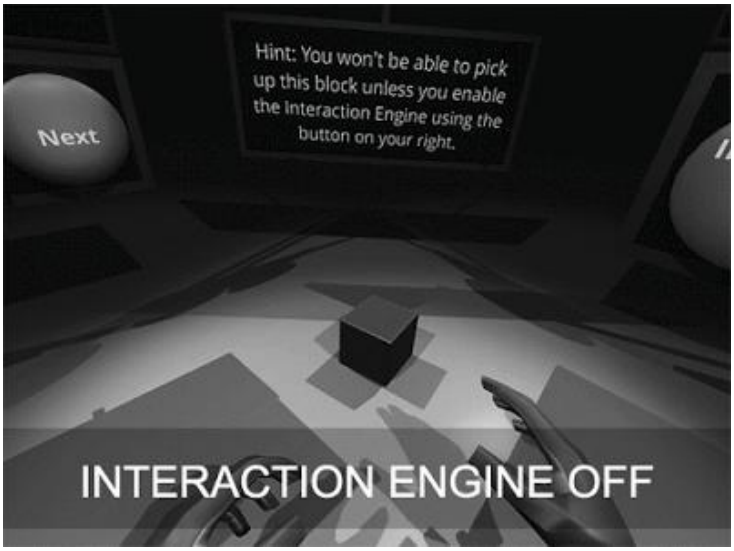
November 28, 2018

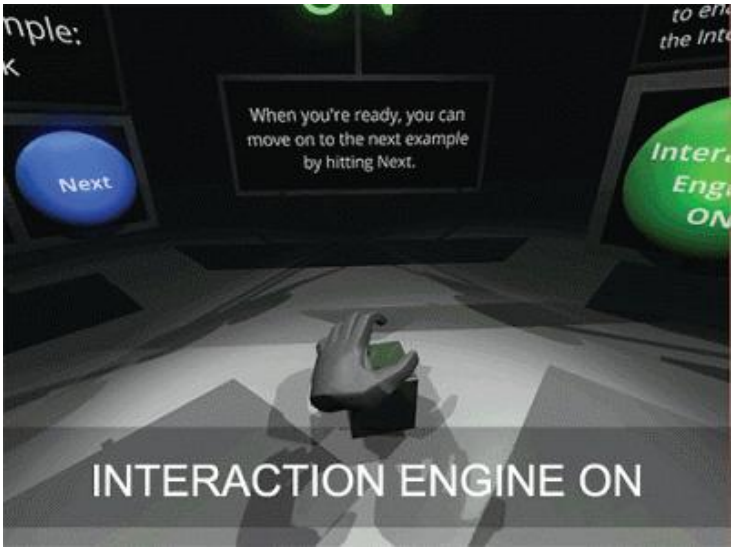
MESSING WITH LEAP MOTION AND ITS INTERACTION ENGINE

—

Update: Stereolabs (the people behind the ZED camera) have put together a guide for getting Leap Motion to work with the ZED camera, you can find it here.

When we started using Leap Motion we knew we wanted players to be able to grab objects and throw them around with their hands. As it turns out the Leap Motion struggles a bit with this, but the developers know this and thus we have the Interaction Engine:



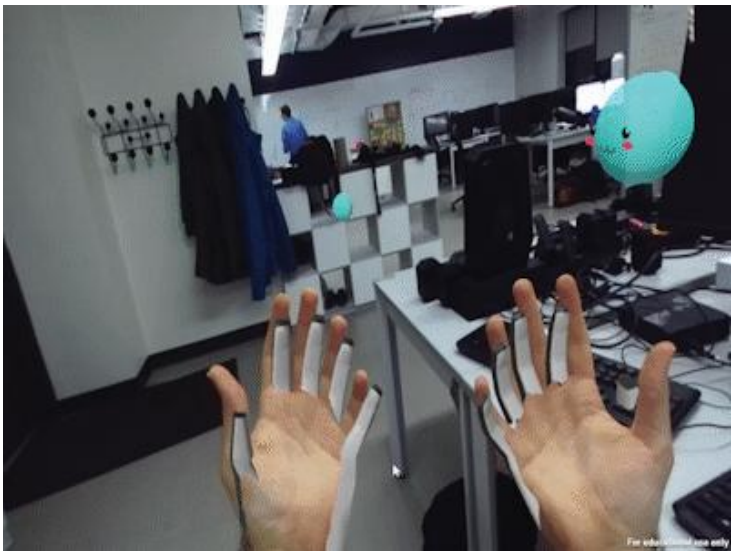


The Interaction Engine allows you to more easily pick up and grab objects using your virtual hands, and before we even started development we knew we were going to need this. However as we began playing around with it we found that people often had trouble actually grabbing things.

The problem with this was two-fold. First, because you could see your real hands in addition to the Leap Motion hands there was a disconnect between grabbing objects with your Leap hands and not your real hands.

The reason for this is that there's a distance between the Leap Motion and the camera itself. If you remember we had to MacGyver together our setup with elastic bands because the ZEDm doesn't support the HP Windows Mixed Reality Headset with its slightly-more-curved-than-normal front.

In this case the Leap Motion is placed directly below the camera, however that distance between the camera lenses and the Leap Motion is enough so that where *you* see your hands and where the *Leap Motion* sees your hands is different. We did account for this however and added an offset to the Leap hands position, but this causes its own problems.

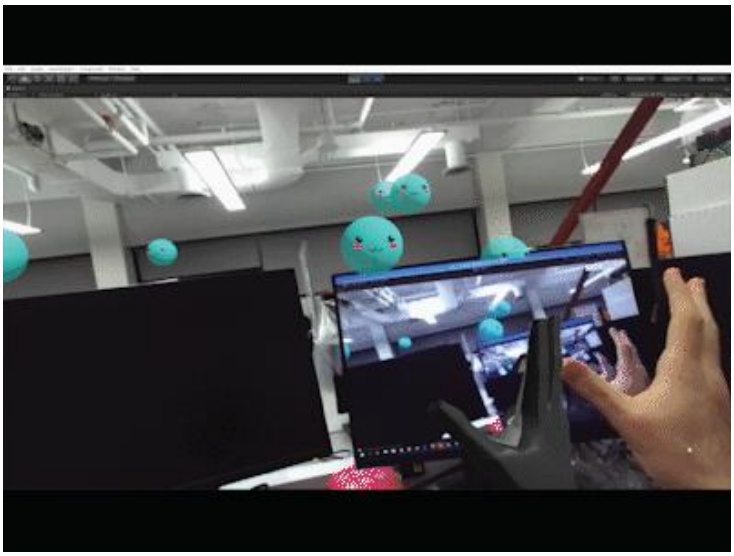


When we rotate around the Leap hands slowly drift away from our hands and get out of sync. It's probably just the way that we're adding the offset, but we're running out of time till our next milestone so for the time being we're probably going to just have the Leap hands a farther distance away from your real hands. Kind of like mage hands.

For reference, our offset is just modifying the position of the Leap hands in LeapXRServiceProvider.cs on line 426. I'm sure we could make it work if we spent more time with it, but alas that's only one part of the problem

The other part of the problem is that from what we've seen it's a little difficult to judge the distance of virtual objects in a real world space. Is it really far away or is it just really small? Figuring out where objects in 3D is hard. When Mario first made the jump to 3D they solved the same sort of problem by adding a drop shadow below him, but we can't really do that.

To help mitigate the problem we added a second, larger, collider that players can grab but won't collide with things. This works but it looks a little weird.



To fix this we simply have to specify the objects position when its grabbed to be set to the grasp point of the hand that grabbed it. This is done in InteractionBehaviour.cs itself around line 1323ish where the grasp movement is set using a new pose.

We still need to work on this to make it look smoother, but for now it'll do.

DEVELOPMENT LOG OF YANI WANG

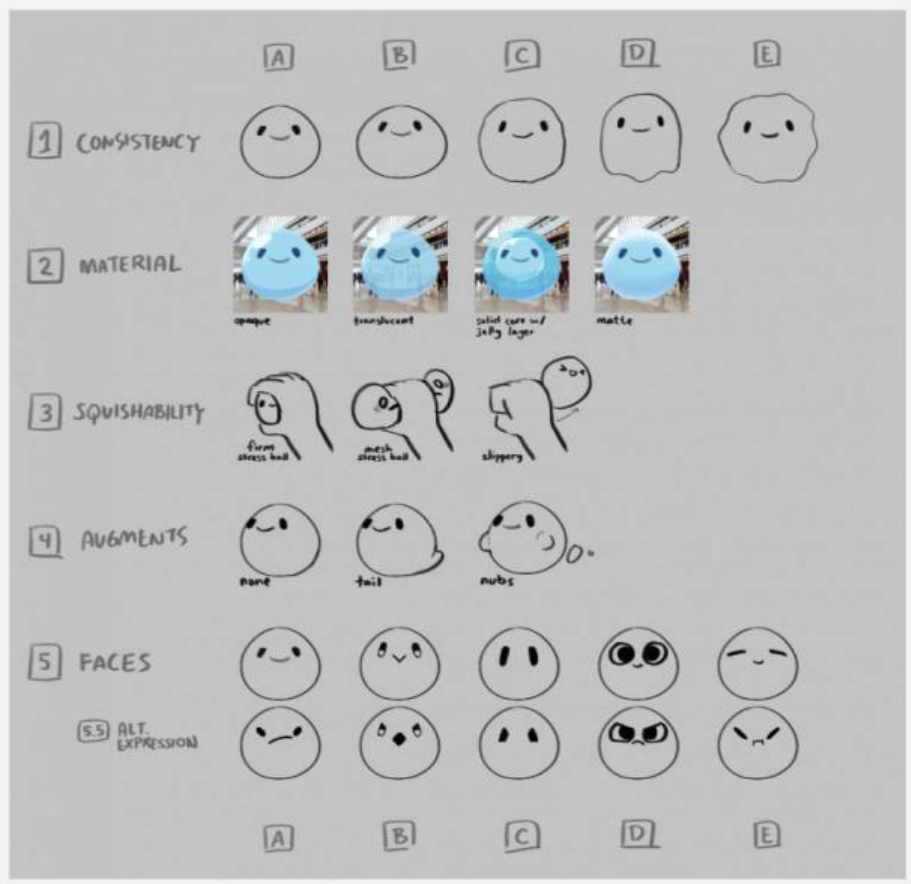
A place for me to document my experiences being a game designer and 3D artist.

DECEMBER 3, 2018 BY YA NI WANG

Development Log #3

Hi again! I'm back with another update on our project. It's now the end of December and the deadline for our Alpha Prototype is rapidly approaching, so we're all working hard to get stuff done. A lot has happened and we've made a lot of changes, so let's go through them.

After the last update, we decided to continue to redesign and test our creature design. Keana made several different iterations of our creature and Jen and James went around the school and asked different people about their opinions about the design. They gathered the feedback in a Google form. You can take a look at the feedback here: https://docs.google.com/forms/d/1fgDB-hNOQsKQjuYd2bE7ItY1KOM2qd3tKVT2c_4WgRc/edit#responses



This is the chart Jen and James showed people for feedback.

After that, we came up with our final creature design. This is the model that we'll be using for the Alpha Prototype and for the near future.

We changed the face, the overall shape, the colour and also gave it little nubby arms. Isn't it cute?

Now, onto the process of taking the mockup and turning it into a virtual model. Originally, I was planning on modelling our creature in ZBrush and then importing it into Maya and play with some textures and shaders to get the effect we wanted, but we recently stumbled upon a Unity plugin called Raymarcher. It does a lot of things, but most importantly, it can bend, twist, and repeat objects easily in Unity without any modelling. In addition, it's all done mathematically without any meshes. So needless to say, I have to make a couple changes to my workflow. The next few days will be spent trying to figure out Raymarcher and ideally get a working model of our creature for our Alpha prototype.

In addition to that, James made an A.I behavior chart for our creature, based on reactions the creature have based on the player's actions. Keana took the chart and made facial expressions. We choose the reactions we wanted, and then Keana drew them out. We were originally planning on just putting them on a mesh, but with Raymarcher now in the picture, we might need to rethink that.

FEBRUARY 1, 2019 BY JAMES PRATT

Dev Log #4 – Designing Booyo Behaviour

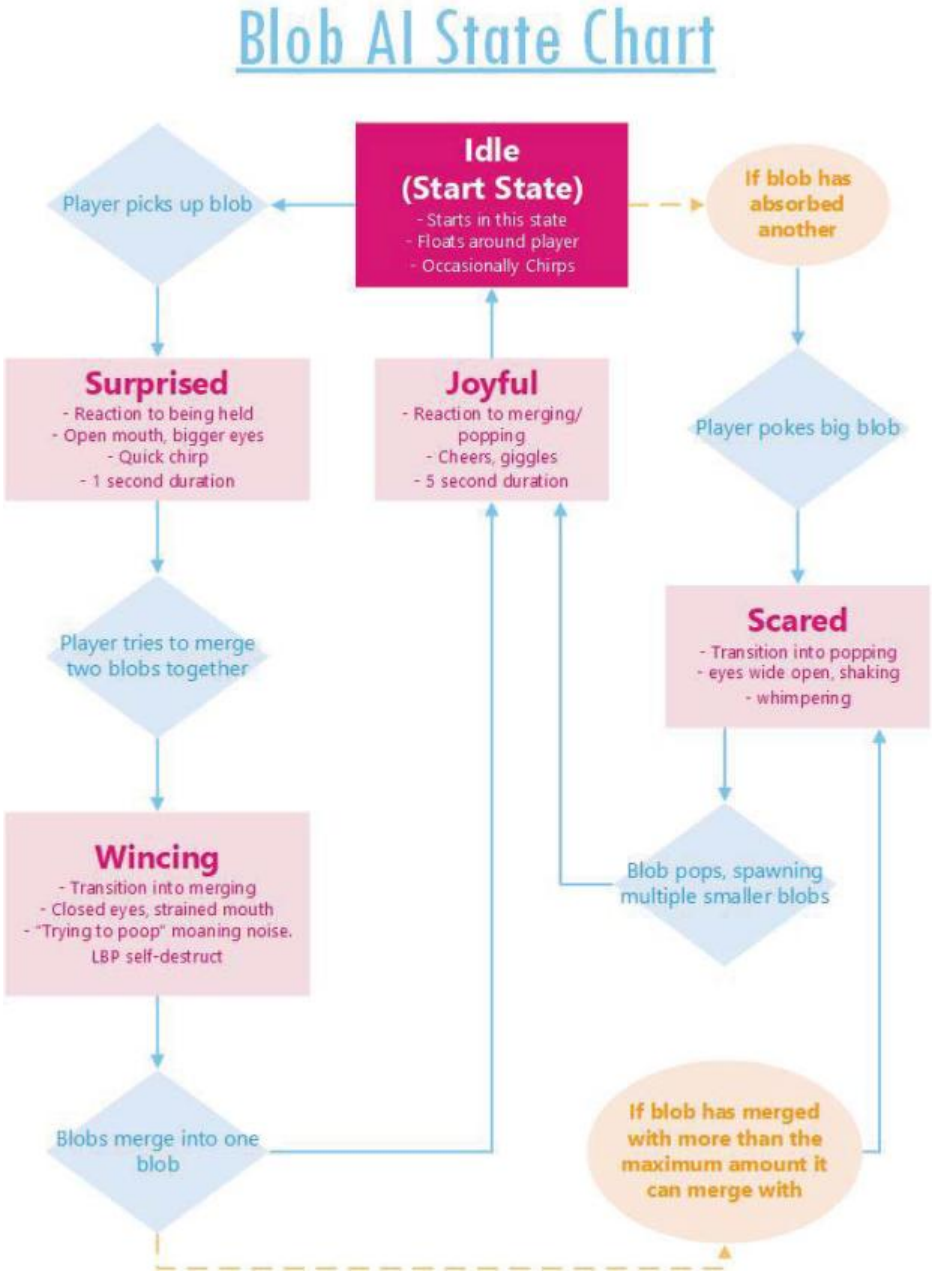
Hey there! It's been awhile, eh? Well to catch you up on what's been going on we managed to figure out what our game title is going to be: Booyo Sitter! In it, you take care with living blob creatures (now called Booyos) as they play, float and interact with each other and the player. Since these creatures are giving off the impression that they are living, that means they have to have some sort of AI system to direct how they behave and how they react to each other and player interaction, and that's what I've been working on for the past few weeks.

Booyo Behaviour

As our team's design lead, it's my job to help communicate and direct how the game works to not just the team but also to our players. In this instance, I was making an easy to follow system that I can hand off to our tech team so that they can implement the functionality. First, I broke down the behaviours in terms of emotions that I knew a Booyo should have. They are as follows:

1. Idle – starting state. State in which the Booyo floats around and waits for some sort of input from the player or another Booyo
2. Joyful- happens when a Booyo merges or after it pops
3. Surprised – happens when a Booyo is being held
4. Scared – a transitional state that happens right before popping
5. Wincing – a transitional state that happens right before merging

Once the main emotions were figured out, I had to define the actions that would lead to that emotion. I wrote down a list of emotions and then a list of actions and started to come up with a diagram that I put through Viso. The end product looked like this:



So this wasn't too bad but I knew that I could be a lot clearer in what I was trying to convey. I went to our artists and asked if it made sense to them, to which they replied that they didn't know what these states would look like other than what the Booyo would look like. That's when I realized that I was doing this backwards.

Fixing my Behaviour Tree

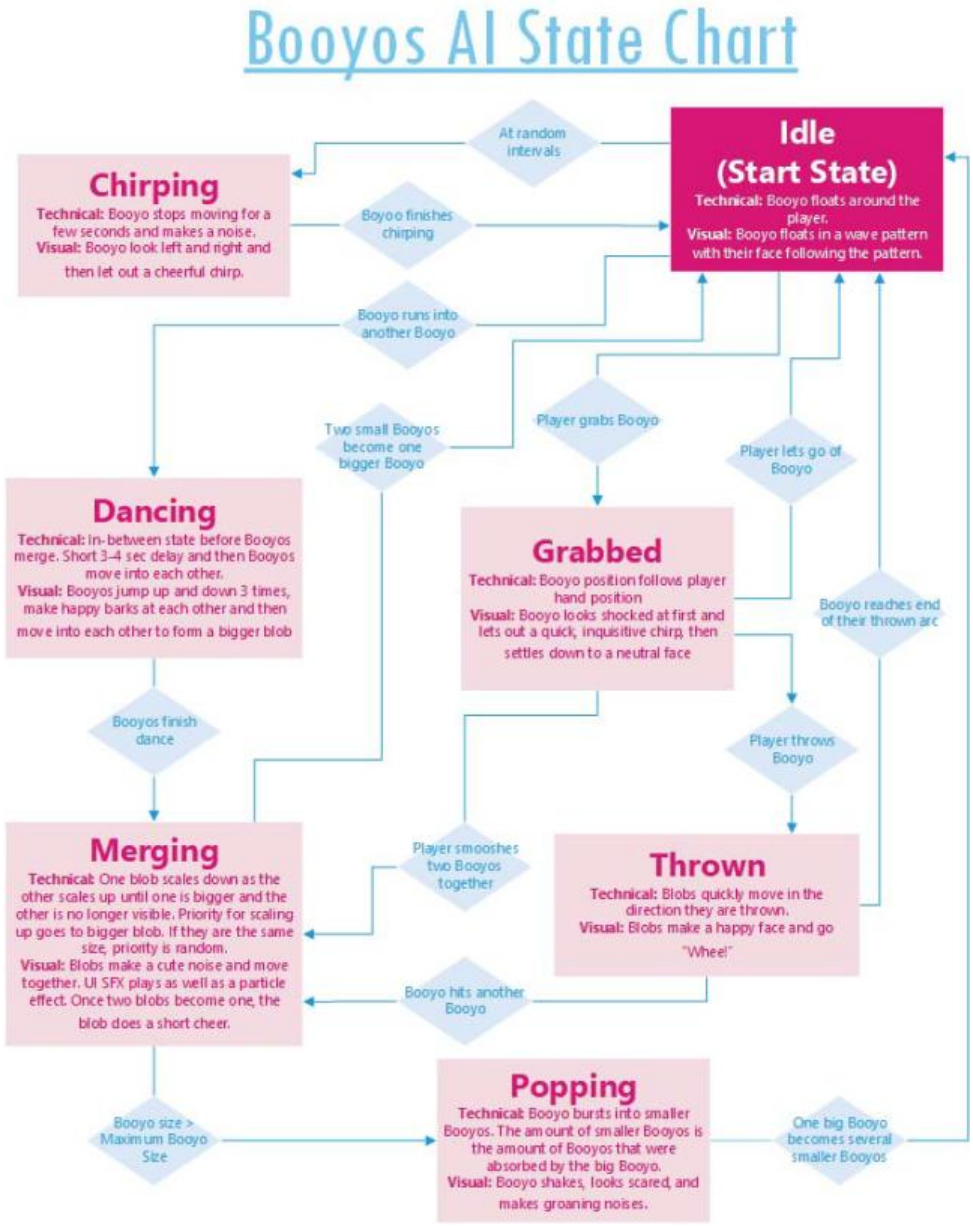
Typically AI states are treated as an action. For instance, a standard guard AI would probably have a Patroling, Searching, and Chasing states (maybe even a Fleeing state) with conditionals that would help navigate it through the behaviour tree. This way of treating AI behaviour makes it easy to understand what the game object is doing in a given state. Using the

guard example again, it's easy to know what that Patrolling means the guard is navigating space in the level in a pattern in an attempt to stop the player or NPC. However, using the behaviour tree I came up with if I said the Booyo is currently Scared, then it's kind of vague as to what the Booyo is doing while Scared. Is it shivering? Is it moving? How long does it last?

I refactored my work and redefined my states to be action-oriented instead of emotions. The states I came up with were:

1. Idle – Starting state, Booyo wanders around player
2. Chirping – Booyo randomly will stop wandering to let out a little chirp
3. Dancing – Transitional state that happens when two Booyos bump into each other without player interaction
4. Grabbed – Booyo's position will follow the player's hand that grabbed it while in this state
5. Thrown – Booyo is sent flying in the direction the player threw it at
6. Merging – After Dancing, one Booyo will rapidly shrink while the other one rapidly grows, giving the idea of being "absorbed". Which Booyo that is doing the absorbing is determined by Booyo size or by random if both Booyos are the same size.
7. Popping – Once a Booyo has reached its maximum size, it will pop and release every Booyo that it absorbed.

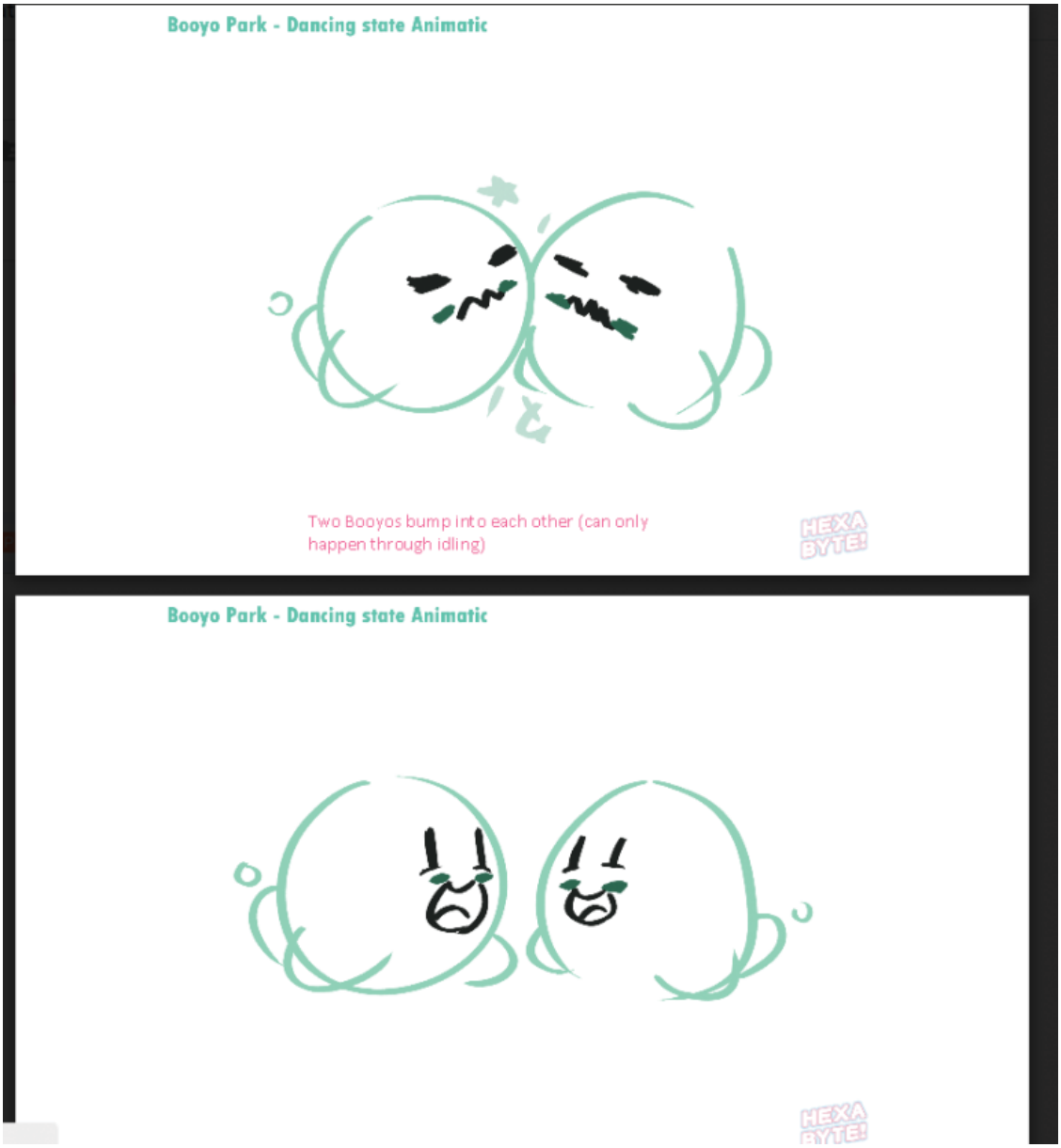
Already I had way more states than when I started with but it's already very clear how these things would behave during gameplay and how they correlate to each other. Following what I did last time, writing down the states and the actions required to get to each, I came up with a few variants of the state tree and came up with this final tree



Bringing it to the Art Team

Now I had something that showed off the logic of the behaviours really well, but now I needed something to convey what these states should look like. I asked my friend in another team what he would recommend and he said to do animatics, which are more or less rough storyboards to convey the progression and appearance. Perfect, exactly what I needed. I drew up a few sketches, threw them into a powerpoint and showed the rest of my team.


Booyo Park - Idle state Animatic
HEXA BYTE!
Booyo Park - Idle state Animatic
HEXA BYTE!



I'd like to wrap up with some things I've learned from this experience and what I think other designers can get from this post.

1. Check in with the people you are communicating to. A big reason why I had to redo my AI tree was that I was working in a bubble for the most part. It was only when I showed my team that I noticed a big problem with its design. If the people you are communicating to is your audience, then test it. Game design is an iterative process because you'll rarely find a solution your first go through.
2. Treat AI states as actions. Seriously. Do it. Some people might tell you to only use words that end with -ing, but honestly, as long as you convey the action of what the AI is doing, that's good enough. Even if the AI is not doing much physically, it helps frame the system a lot better and it makes it easier for other people to read.
3. Don't be afraid to use different or unconventional tools to help explain a design. At first glance, I dismissed animatics as an "animator only" tool. This couldn't be farther from the point. Using the animatics, I was able to effectively communicate my direction to the art time so that they can have a frame to animate. This goes for any other tool or technique that might be viewed as niche or exclusive to a specific disciple. Branch out and try new stuff. If you have a weird thing you need to convey, then chances are there's a tool that will help you convey it well.

What's next?

Now that we have a clear idea of how Booyos behave, I can go into the engine and start to implement the logic. At the time of writing this, next week's goal is to get the AI behaviour completely implemented into the game so that tech and art can come in and add the functionality and animations to bring these Booyos to life.

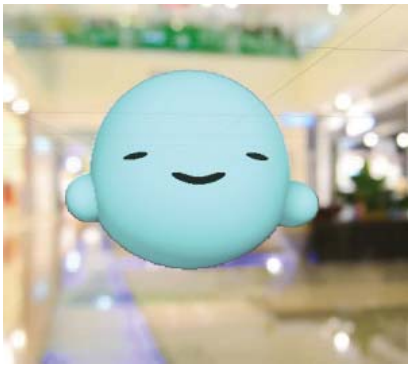
FEBRUARY 1, 2019 BY JENNIFER STIENSTRA

Making Narrative and User Experience Work Together

For a project such as ours, the overall user experience is of major importance. Not just when they're engaging in the experience, but before and after as well.

We use different kinds of hardware that most people just don't have, so selling it commercially never made sense. Instead, it's a game that is meant to be showcased in different brick-and-mortar locations. This means that we can expect people standing around and waiting to try out the game, not just playing it. And there's only so long that people will wait. Then there was the process of getting the player set up in the tech, which includes a backpack computer and headset with a zed mini camera and leap motion strapped onto it. We have to help them put on all of the gear, and this can be awkward for the player.

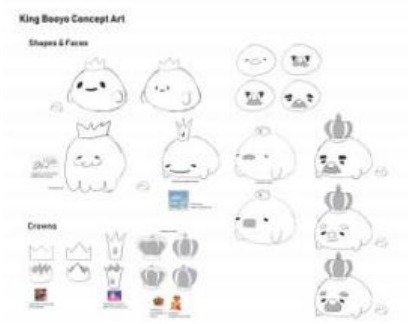
To make the onboarding process less awkward and make it fit with game, we developed a narrative that there was a secret world on top of our own and could only be seen when the player put on all of the tech. The creatures that appear in our game, the Booyos, only existed in that world. With the get up we had them in, they were capable to interact with the creatures.



A booyo from our virtual experience

This was the base narrative for the overall project, a good starting direction. But it wasn't enough. There was still the issue of the people waiting for their turn.

And thus, King Booyo was born. Initially, King Booyo is the part of the experience that ties everything together, from when the person is waiting, to when the experience ends.



Concept art for King Booyo

Who is King Booyo? He is King of the Booyos, and he needs help. King Booyo is going away on a business trip, but someone needs to watch and entertain his Booyo children until he returns. That's where the user comes in.

The user is introduced to King Booyo and his predicament while they stand around and wait for their turn. They are simultaneously entertained while still already being a part of the experience. They are introduced to the context of the narrative before they ever put on the backpack computer or headset.

They are still involved in this narrative when they are putting on the equipment that allows them to see the Booyos that they will be needing to take care of. Once the user is wearing the equipment and beginning the virtual experience, King Booyo appears to them, connecting the video they had seen while they were waiting to the virtual experience. He reappears once again, having returned and calling away his children. This was supposed to mark the end of the virtual experience, and the user would know that their overall experience had finished.

Unfortunately as a result of time, King Booyo was never taken past conceptualization as a result of lack of time and not supporting the mechanics, but the need for narrative to keep people entertained and to meld the experience all together was still needed. And we so decided to take a more literal approach and considered introducing them as wild creatures. Booyo Park then became a petting zoo. An onboarding video was thought up that would entertain the guests and introduce Booyos as wild and cute creatures users could only see with the headset.

Together, the narrative positively impacts the UX, and ties the entire experience together.

JUSTIN CAPCAP
Game Designer

FEBRUARY 1, 2019 BY CAPCAP

Technical Dev Log – Leap Motion Hands Calibration

For the past week I ended up revisiting a problem we had earlier during the semester. This problem involved the leap motion hands being visually offset from the player's real hands. This posed a huge problem in terms of UX where players where having a difficult time grabbing the booyos because of the visual disparity in terms of distance between both sets of hands. Most of the users end up taking quite some time before they can get used to it. Evidently this is one of our biggest problems in terms of leap motion controls.

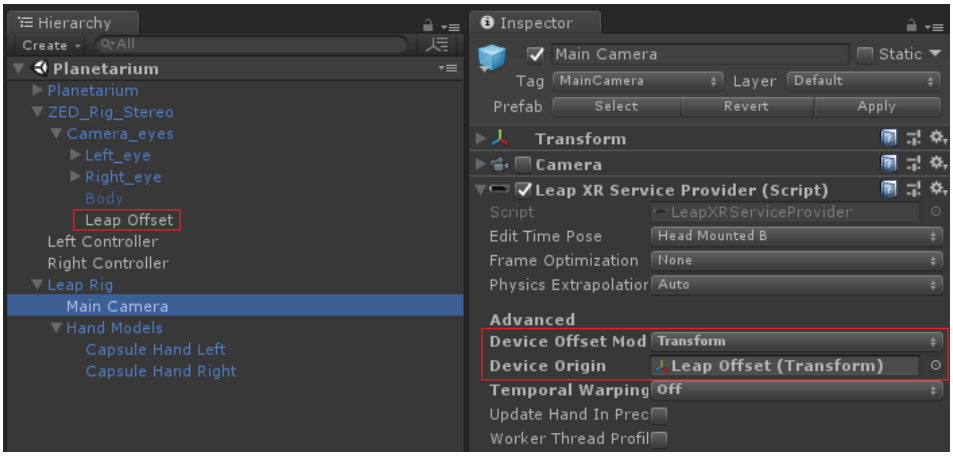
Earlier during the semester, I managed to somewhat remedy this problem thanks to a blog written by Stereolabs.

Using Leap Motion and ZED Mini for AR Hand Tracking

Leap Motion's hand tracking technology makes grabbing and poking virtual objects nearly as simple as in real life. Combine this...

Stereolabs

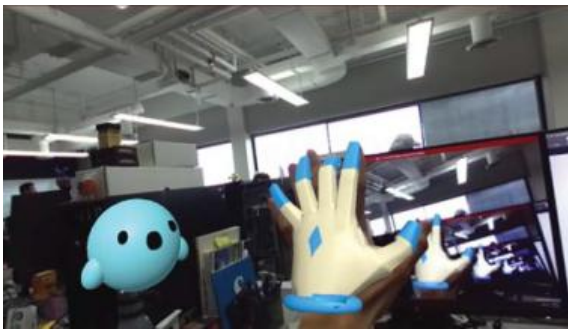
Essentially, the way stereolabs is handling this offset is by creating an empty gameobject and using that as the Device origin for the virtual hands. And then during runtime, you would manually calibrate the hands, and then copying the transform component of the empty gameobject, and pasting it back afterwards.



https://www.stereolabs.com/blog/leap-motion-zed-mini-hand-tracking-ar/

After applying the necessary fixes, it definitely contributed to syncing the hands more accurately. But after a couple more testing, we found out that eventually the hands get offset again and we would have to manually calibrate it all over again. Since this process ended up becoming a bit tedious to keep having to repeat, we decided to only calibrate it before making builds. It was a doable process and we decided to leave it at that. This was the case until we ran into another problem.

The hands get drastically offset depending if we're running the build from the towers or the backpack computers



tower offset

backpack computer offset

After some testing, I found out that the hands are offsetting in consistent values. When running the build from the backpack computer, the hands are always offset by about 5 units upwards on the y axis. Why is this happening? I have no idea. But I just fixed this by adding an option that lets you toggle between the tower and the backpack transform.

Remember our problem earlier where eventually the hands get offset even just a bit? I ended up going back to this for the reason that it still happens despite perfectly calibrating it right before making a build.

I found out that one of the reasons why this is happening is because of the position of the physical sensor on the headset. The Leap Motion's position relative to the ZED mini camera affects this offset heavily.

This means that the relative position has to be exactly the same between from when we make the build and when someone is actually playing the game. This is near impossible particularly for our case because of the fact that we never actually 3D printed a mount, and instead we relied on rubber bands. This means that the both the ZED mini and the leap motion will inevitable be moved one way or another: when the user is wearing it, the rubber bands get loose over time, they get bumped by your hands, simply repositioning it. There's a million other reasons why they would get moved and at the end of the day, it's just impossible to really make sure the positions are extremely accurate from when we made the build. A simple solution could be is to simply 3D print the mounts. However this is only of the reasons, I also encountered other tech issues that causes the hands to get offset no matter what.

In the end I concluded that this is just one of the problems that I really cannot fix. It came to the point that I've wasted one full week of just troubleshooting and trying to find a solution. I pretty much gave up on trying to perfectly sync the hands and ended up brainstorming of ways to design around this. UNTIL... I SAW THIS TWEET!

Yujin Ariza
@YujinAriza

back at the leap/zed stuff again.

reverse engineering the old leap motion "image hands" feature but using the stereo rgb feed from zed instead.

with manual calibration, it's surprisingly not bad. i inflated the mask hands a little just to be safe.

149 9:37 PM - Feb 12, 2019

17 people are talking about this

I messaged Yujin asking how he was able to get such an accurate sync between both pairs of hands. It turns out that we were actually doing something very similar, and that was to use an empty as the device origin, which we would then later position on top of the hands. The biggest difference was that Yujin was manually calibrating it on runtime… using a keyboard. It hit me like crazy, why in the world are we trying to get the perfect sync when we could just calibrate it during runtime. Our setup also included a wireless keyboard that we can just use, so this made perfect sense.

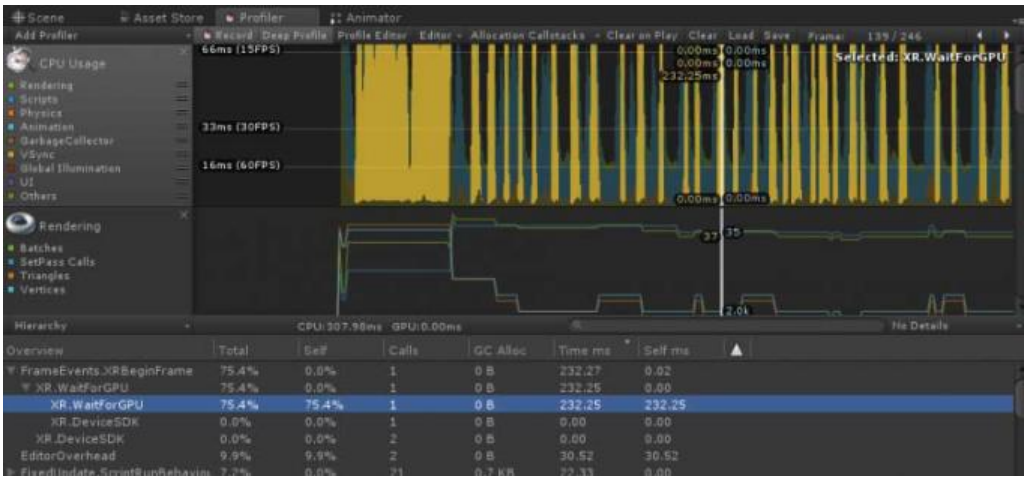
After a simple implementation, there we go, perfectly synced hands!

If there's anything I learned from this experience is that you really don't have to fix it, sometimes you just have to go around it. I mean, this was quiet evident for me even back then, but it never really hit me this hard until I started working on tech that frankly, I have absolutely zero control of.

KEANA ALMARIO
Hexabyte Games

FEBRUARY 1, 2019 BY KEANA VICTORIA ALMARIO

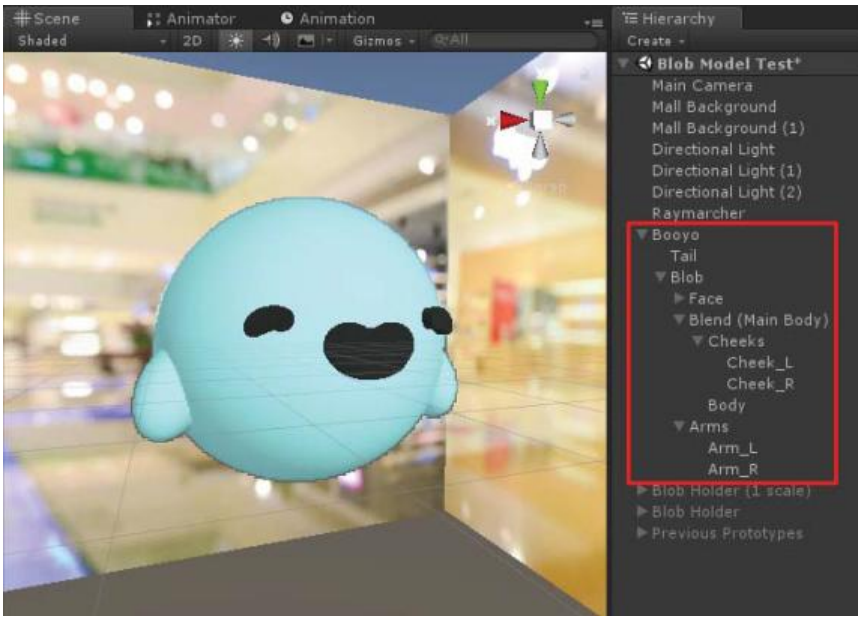
Devlog #4: The Compromise between Vision and Optimization



The Unity Profiler, showing that we were running at 15 frames per second with 12 Booyos. Not good!

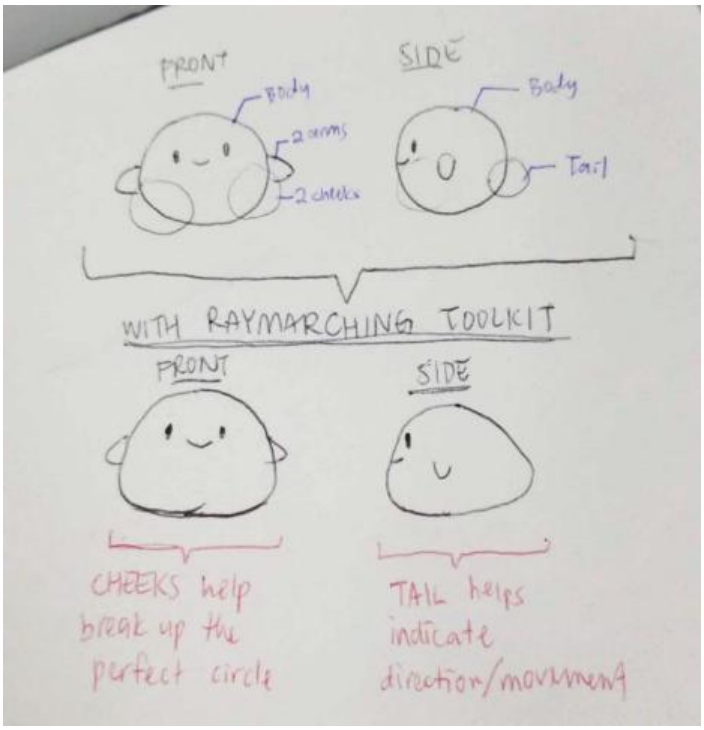
Recently, we found that the blobs – now named Booyos – I created in Unity were not as optimized as we had hoped. For this part of development, I focused on restructuring the Booyo, trying to remove as much excess detail as I could while still making them look like the blobby creatures we imagined.

The structure before



This is how the Booyo's structure looked like, when they made our game run at 15 FPS.

Booyos are made of several small spheres, most of them blended together using the Raymarching Toolkit we're using for this project.



A sketch of the different elements used to create the Booyo model in Unity.

Using this method, **each Booyo would have 6 Raymarched objects**. This is a huge problem, because the developers of the Raymarching Toolkit for Unity recommend having **less than 10 Raymarched objects in a scene**. This is how our 12 Booyos hit the game at 15 fps. I had to find a way to lessen the number of Raymarched objects, while still keeping these Booyos expressive and cute.

Maximizing expressiveness with minimal joints

The structure of Booyos is minimal. They consisted of:

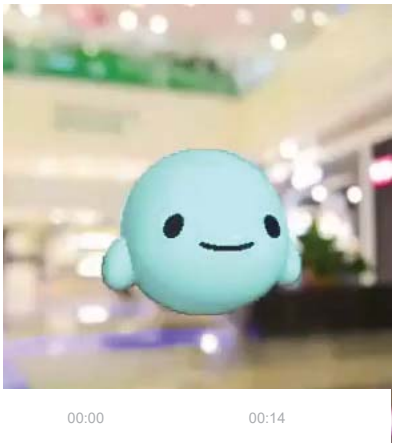
1. a body, which is just a sphere,
2. two cheeks, which are smaller spheres that blend into the body,
3. a 'tail', which is a smaller sphere that blend into the body and lags behind the it when the Booyo moves,
4. two arms, which are just small, elongated spheroids (with no elbows), that do NOT blend with the body,
5. a face, which is a mesh we model separately in Maya. Booyos' expressions will only switch between each other (i.e. there was no tweening).

Because of these limitations, I was worried that I would not be able to make them look as expressive and adorable as we wanted. I decided to do quick animation tests to see how expressive these Booyos can be. While testing out animations, I had some rules set for myself:

1. The Booyo could not change its position using Unity Animations. because we were handling movement using Unity Physics, I restricted myself from doing additional movement using Unity Animations. If I did, both movement methods would add up to each other and make the Booyo's movement look unnatural and uneven.

2. The Booyo needed to have an exaggerated squash and stretch. Even though the Booyo was technically just a simple sphere, I wanted people to *think* it was a jelly-like creature. Therefore I needed to show the player that Booyos were very malleable and soft. This also works well with the way Leap Motion handles the grabbing of objects: the Leap Motion hands go *through* objects, and there's nothing really stopping it from phasing through them. With this and the exaggerated squash-and-stretch Booyo animations, we can reinforce the feeling of the Booyo's soft and squishy features.
3. The Booyo had to have a relatively strong(?) follow-through and a slow recovery. Booyos are floating creatures. I wanted to make sure that their actions made it feel like they were light and floaty creatures, and that it would take a little bit of time for them to stop and recover from a big animation they just did.

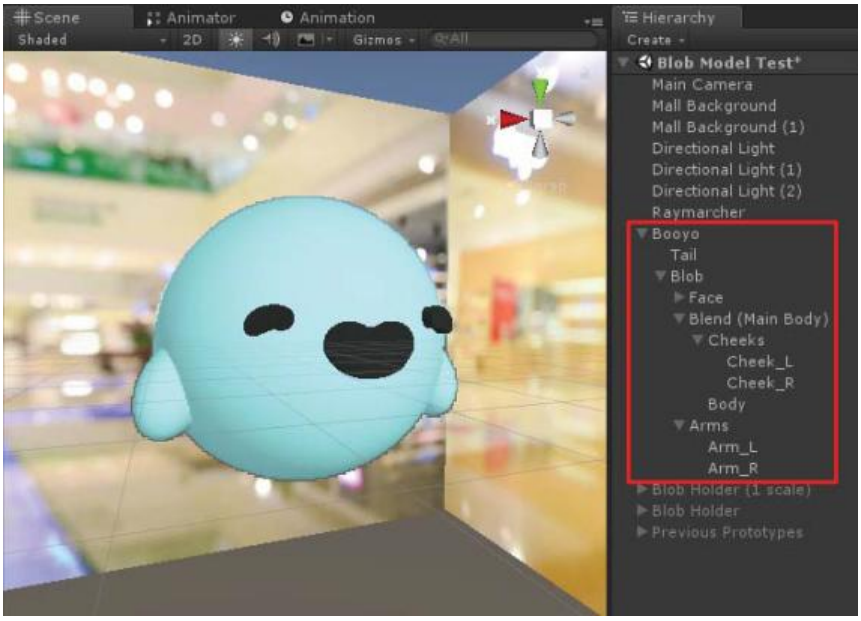
Using these rules and limitations I set for myself, I made a test animation of a happy Booyo.



So far, the test was a success. Now I had to optimize the structure a little more, then test to see if the animation was still successful.

Compromise & optimize

As we showed before, the structure comprised of a body, 2 cheeks, 2 arms, a tail, and a face:



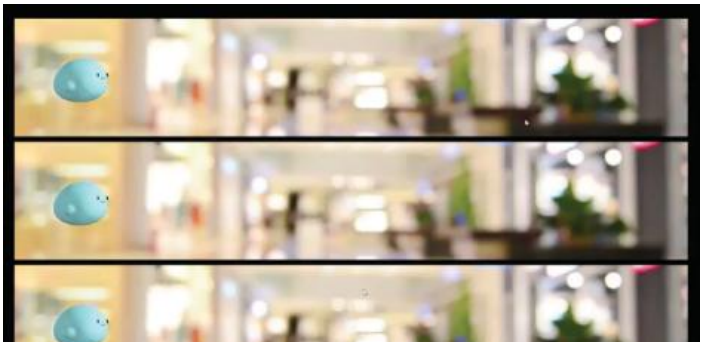
This is how the Booyo's structure looked like, when they made our game run at 15 FPS.

I decided to make some sacrifices.

First, **I removed the cheeks**. They were integral to breaking the Booyo's unnerving, perfect circle body, but removing them would cut our Raymarched object count by 1/3. It was a good deal.

Next, **I turned the arms into meshes**. They were previously Raymarched spheres with *very minimal* blending on them. I figured that since they would be seen from afar, the difference in material would not be obvious to the player.

Lastly, **I turned the tail into a general body modifier**. Instead of keeping it far behind the body (so that it doesn't mess with the Booyo's face), I put the tail's anchor a little nearer to the body's center. I also changed the direction of the tail's movement.



00:00 00:09

This is the video from my previous post. Before, the tail would only move back and forth. Now, I changed it so that the tail would be able to move in all directions:

00:00 00:26

By making it go in any direction, there was much more flexibility with the Booyo's perceived shape. The cheeks were important because they broke the perfect-circle shape of the Booyo. However, by making the tail a dynamic shape deformer that reacted to player's actions, we could make these Booyos look more organic AND make them look a little distinct from each other, like the *kodama* spirits from the film *Princess Mononoke:*

Kodama from Princess Mononoke

Going forward…

After deciding on the consistency and springiness we want for the blob, I want to test out basic animations with the blob's arms. Since it doesn't have segments in its tiny limbs (i.e. no elbows), I want to see the extent of its expressiveness. I also want to work with our programmers to further optimize the Booyo, so that hopefully we can keep our game as close to the ideal 90 fps as possible.

ART

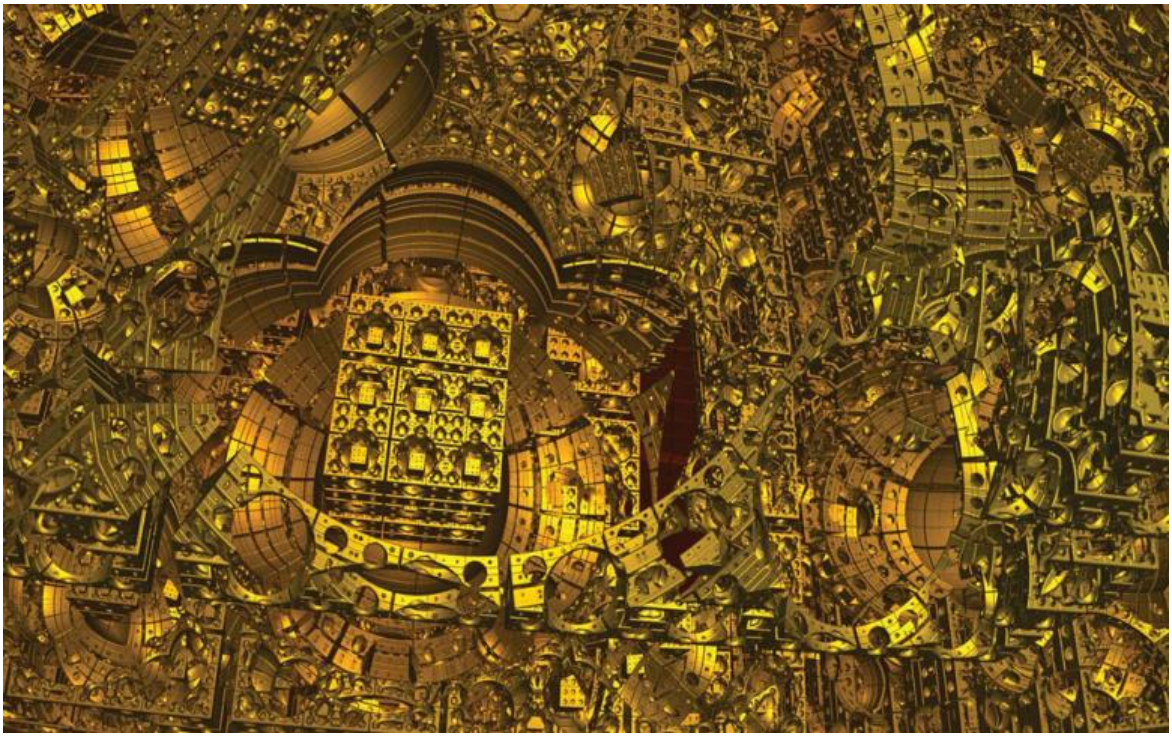
February 04, 2019

WORKING WITH RAYMARCHING TOOLKIT FOR UNITY

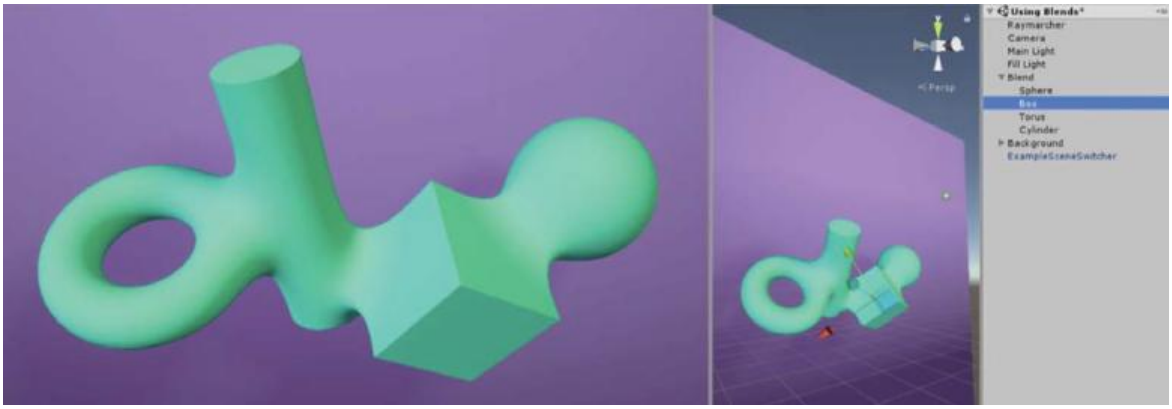
—

Along with the other four pieces of technology we have taped together, we also have one other thing helping bring our blobs to life: Raymarching.

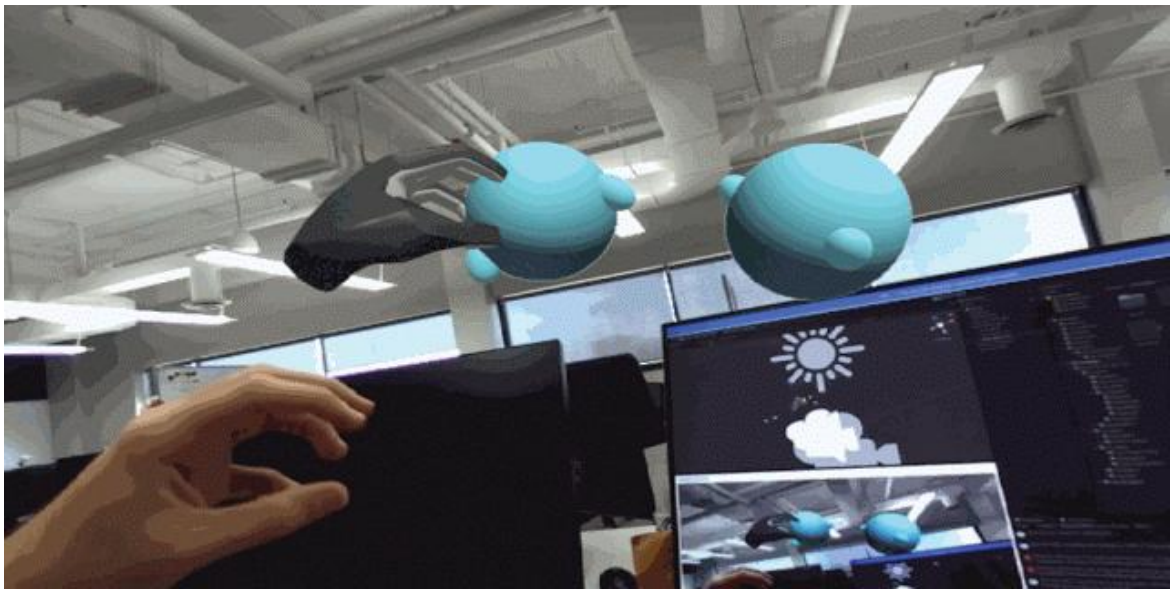
I'm not really qualified to talk about exactly what raymarching is or how it works, and if you want to know more about the nitty-gritty of it there are several smarter people that can explain it far better than I ever could. Long story short it's a form of rendering, and with it you can do things like this:



Pretty neat, but the fractals and infinitely repeating shapes aren't what we're after. What we want is this:



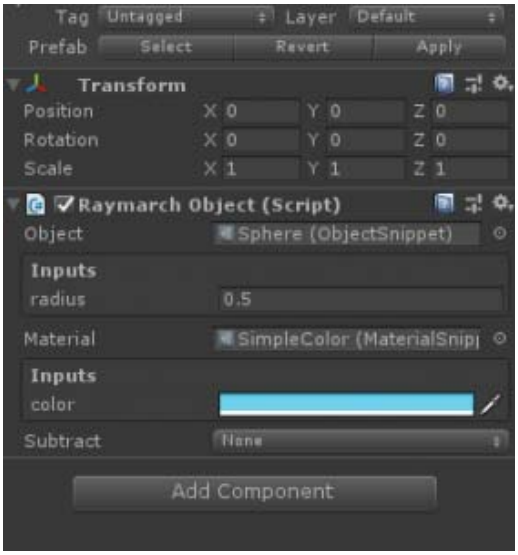
Using Raymarching you can blend shapes together, which also happens to be the perfect kind of consistency we're trying to give our blobs. Here's an example of what it looks like with the blob and its "tail":



We're using Raymarching Toolkit for Unity to do this, but using it isn't all sunshine and rainbows and there are a few limitations to it. The most straightforward ones are outlined on the websites limitations page , but the tl;dr version of it goes something like this:

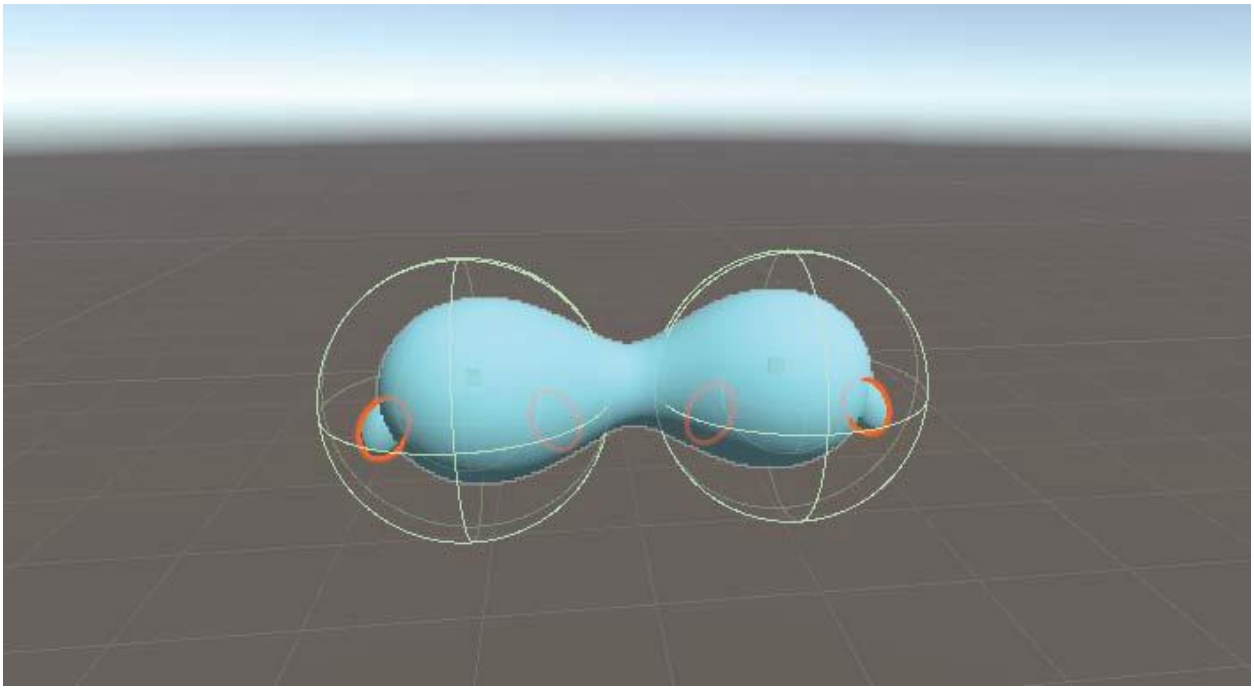
- **You can't (shouldn't) have more than 10 Raymarched objects.**
- **Raymarching doesn't work with an orthographic camera**
- **You can't change the hierarchy while the game is running (no moving children of objects around)**

Beyond that however there are a few things that you should also probably know.
The first is that if you haven't been paying attention to how raymarching works, you may be surprised to find out that **Raymarched objects don't use meshes.** Raymarched objects are created through shaders which means a couple of things.



The first is that if you want to animate anything made of raymarched objects you'll have to do so using Unity's in engine animation, which may be an issue if you're used to working in an external 3D modeling program like Maya. There may be some way to work around this using placeholder objects in Maya or whatever and then replacing them with raymarched objects in Unity, but that's a headache we didn't want to deal with.

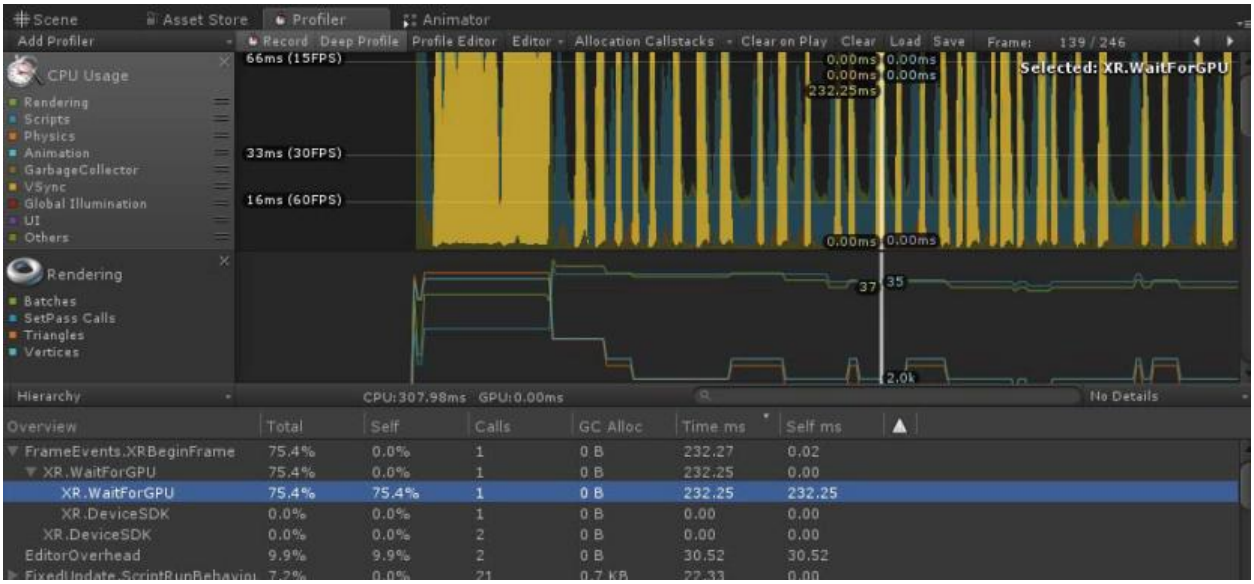
The second thing that this means is that raymarched objects can't track collision. Yes, they can do their neat blending stuff but unless you put a collider on them you won't be able to get collision and trigger messages like OnCollisionEnter(). You can still put a collider on raymarched objects, but keep in mind that your colliders won't deform in the same way that your raymarched object. A sphere collider will stay a sphere, no crazy blending there. I have however seen some people get dynamic collision on raymarched objects, but you'll have to figure that out yourself.



The last thing that because raymarching is all done via shaders you'll need to know some shader code if you want to be able to change things past a certain point. Let's say that you want a sword to be raymarched, we can't 3D model a sword and import it so what do we do? We'll one option is to make it yourself via shader.

Now thankfully the Raymarching Toolkit for Unity comes with several basic shapes, so if you have no idea how to write shade code a better option may be to instead make the sword out of simpler primitive shapes. However we then run into the issue of performance. Remember, you can only have 10 raymarched objects per scene, and your probably going to use all of them making the sword. To solve this you'll have to use modifiers to mirror and transform raymarched objects, however once again if you need anything beyond what the toolkit provides you'll have to make write it yourself the same way you would make a custom shape.

But man, that whole "no more than 10 raymarched objects" thing is a real bummer huh? What if we just ignored that? Well, early on we had stress tested raymarching with around 30 raymarched objects and it seemed to be ok~ a slight drop but nothing too drastic. Thankfully the machines we're running on have top of the line specs so we figured we would be able to handle whatever.



This was not the case. The initial design we had for the blobs was a bit too much, and with 12 blobs we were running less than 15 frames a second. Our blobs were made up of 6 raymarched objects each, so with 12 of them we were well over the limit of 10 objects. To cut down on the numbers we swapped out a couple of raymarched objects for meshes, since some objects didn't really need to be raymarched.

Hopefully you have a better idea now whether or not you want to use Raymarching Toolkit for Unity. From what I've seen there aren't a whole lot of raymarching solutions like this, the only other one I know of being uRaymarching but the developer of that is Japanese so you might have a bit of trouble with any notes or documentation if you want to try using that instead.

DEVELOPMENT LOG OF YANI WANG

A place for me to document my experiences being a game designer and 3D artist.

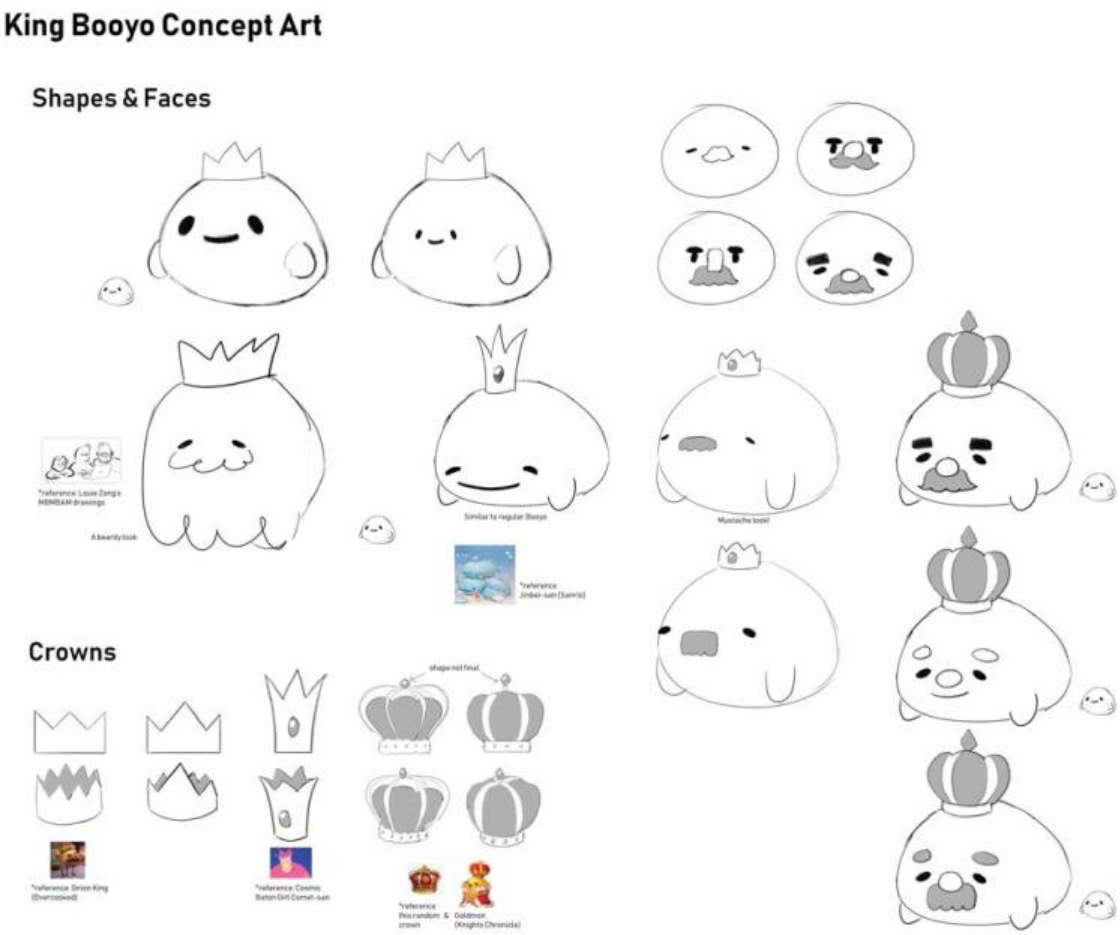
JANUARY 31, 2019 BY YA NI WANG

Development Log #4

Hey again! I'm back again with a new development log. A lot seems to happen every single time I update, but this time, truly a lot has happened. Last time I updated it was before the winter break and my team and I was all experiencing a lot of burnout and general fatigue from working on our game. We were rushing to meet deadlines and overall just wanted to take a break from this project. After that, we all enjoyed a break and came back with fresh minds.

We're continuing to meet with our Shadow Factory contact Keiran Lovett, who's been amazing and an incredible source of invaluable information and advice. In addition, we've also continued to meet with our mentor Jose, and Keana and I have kept up our meetings with our art mentor Jon. I truly feel thankful that I have so many wise and experienced people around me to help us grow and succeed.

We now have a name for our game: BooyoSitter! Our creatures are called Booyos, and the game starts with King Booyo descending from the sky and with a wave of his magic scepter, you gain a magic effect on your hands, and he asks a favour from you to take care of his children. After that, all the Booyos appear and with your magic hands, you can now touch and interact with them to keep them entertained while King Booyo is away on *Kingly Business*. After a while, King Booyo returns and thanks you for your generosity, and ascends to the sky once again.



King Booyo concept art by Keana Almario. Look at that beautiful, regal moustache.

As for myself, I've been mainly focusing on branding and design for our team. Before starting this 4th-year capstone, I didn't realize how much time we would have to spend just keeping up with external deadlines and stuff like branding, social media, and web design. It takes more time than you think and underestimating the importance of these things can be a big mistake. For our team, we want to create a strong web presence so that people will recognize us when we start showing BooyoSitter at various conventions around Toronto.

bit.do/hexabytegames

Here's the framework of our team's website. All the assets and writing on here are a placeholder for now, they will be replaced with correct assets and writing later on.

Hexabyte! @ LevelUpTO
@hexabytegames

Hello! Anyone out there? 😊😊😊😊

27 4:45 PM - Jan 31, 2019

See Hexabyte! @ LevelUpTO's other Tweets

A peek at the animations for our Booyo, by Keana Almario. Also, a glimpse at our new Hexabyte! Twitter.

I recently modeled some face meshes for our Booyo based on the A.I chart I've gotten from the designers. These are the emotion's we're planning on implementing in our game.

I modeled these in Maya based on concept art from Keana and also from a couple of animatics by James Pratt.

Needless to say, a lot has happened. The winter break felt like a breath of fresh air for Hexabyte! We've had a lot of good ideas since then, and I'm excited to see what happens next.

MARCH 15, 2019 BY JAMES PRATT

Dev Log #5 – Cutting Content

My plan for this week's post **was** to write an account of our play testing we had earlier, but my body decided that wasn't going to happen and went ahead and got sick so here we are. I don't think it would be fair to write about something that happened without me so this week I want to talk a bit about a feature I fully designed that ended up getting cut from the final game. Why? I'll talk about that later.

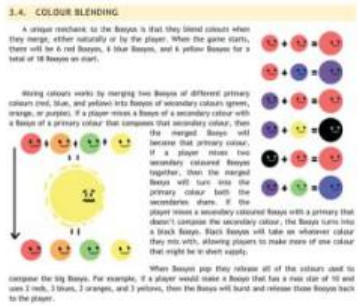
Booyo Park is designed to be an open-ended experience, allowing players to decide what they want to do and how. There are no explicit goals, objectives, or missions in the game; only a handful of rules and interactions that handle how game objects behave and interact. This is why the team refers to the project as a "virtual petting zoo" and not really a game. However, this doesn't mean that players don't want goals to try an accomplish, as that's one of the most common pieces of feedback we get during playtests.

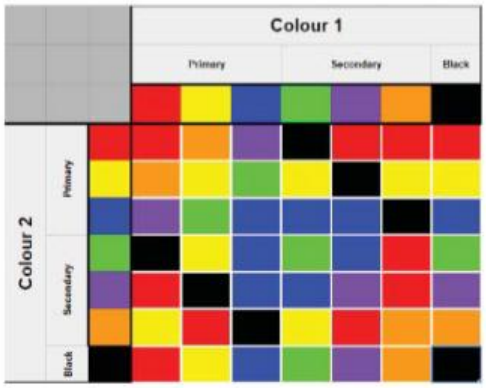
Earlier in the project, we decided on the open-ended design of the experience after trying and failing a couple of mechanic heavy concepts. The issue we had was that we would have to teach how to accomplish them in a very short amount of time in a completely new environment, mixed reality. We were given advice from our contact in Hong Kong that we should focus more on an experience rather than a goal, which is what we set out to do. Here we are now, and the most common thing we get from players is they want a specific goal to work towards or some sort of player agency.

This had us a bit stuck. We originally had a laundry list of interactions the player could have with a Booyo but this was all in service of the open ended nature of the experience. By implenting a goal it breaks our design wide-apart. We knew that if we were going to implement a new system, it would have to work hand-in-hand with our current design instead of against it. We hashed out some ideas, came up with a new character (who was also shortly scrapped) and came upon the idea of colour mixing.

Most of the interactions, with the expectation of resetting, are all natural gestures that are based in real world interactions. If a player grabs a Booyo, then the Booyo in turn would follow the player's hand while they move it around screen. One idea that we ran with was mixing Booyo colours when you merge them together. Most people are exposed to how colours mix when they are very young. However we knew it couldn't work exactly how it usually does as eventually players would end up with a gross, muddy colour, so I came up with a new mixing system.

It's more or less your standard mixing system, mix two primary colours and you get a secondary (red + blue = purple), but now if you mix a secondary and a primary, you get that primary back (red + purple = red), mixing a primary that didn't make up the secondary will get black (purple + green = black, more on that later), and mixing two secondaries will get the primary they both share (green + purple = blue). Black works like a cloning colour and will take on any colour that mixes with it. I wrote up how the system would work in our game design document and followed it up with a quick table to show how the combinations would work





As you can see, all the pieces were in place, the mechanic was all set to go. All that was needed to go was to actually implement the feature into the game. Two weeks later, it was scrapped.

As the person behind the system of the feature (which mind you, aren't all that complex), you'd assume that I'd be upset that my precious "mechanic-baby" was denied access to the full game, yet it's far from the case. I was the one that suggested we scrap the feature, so why?

First, and probably more logistical, is that by the time this mechanic was planned out, it was only a few weeks before the game was officially in gold state. Now was not the time to fix design challenges by throwing more mechanics and systems at it, it was time to reduce. Priorities fell on different tasks and this one didn't hold nearly as much weight towards the final project so we scrapped it. Lastly, it just didn't add anything to the core experience of the game. Sure it was a neat addition and definitely added more player agency to an otherwise open experience, but it took the focus away from interacting with the Booyos and now shifted the focus on finding all the colours. It felt like it worked separately from the rest of the game as opposed to working with it, so it was scrapped.

When arriving at design challenges, it's important to remember that adding more mechanics is not always the answer. It's often tempting to add things that might enhance, improve, or engage but what tends to happen is that adding mechanics can threaten a game's scope or make a game feel a bit unfocused. Sometimes a better solution to a problem is taking away instead of just adding. The best part is that the mechanic ended up evolving into a planned design to have Booyo's change colour based on where you find them, which addresses the initial design challenge we relieved back in September. The great thing about ideas being quick to produce is that they are also great to reuse.

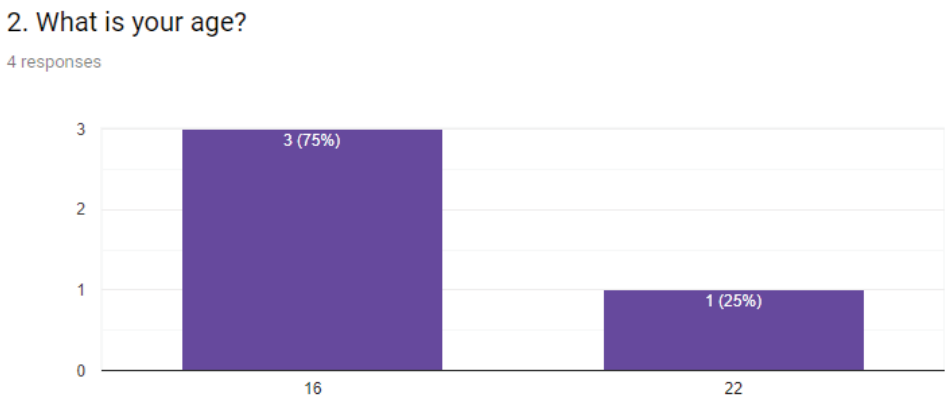
MARCH 15, 2019 BY JENNIFER STIENSTRA

Booyo Park Playtest Results with our Target Demographic

On March 12th, we held a playtest session with 4 playtesters. Since our last formal playtest, much had changed in our project. The biggest and most notable change was having a more stable build. Michael and Justin had both worked hard in the week and a half leading up to the playtest to ensure we had a build that didn't crash or bug out after a few minutes. We had also implemented animations and audio, making the characters feel more alive in this playtest than in previous tests.

Our objectives for this playtest were to test several things, including their progression in terms of interacting with the player, their reactions to the Booyos themselves, the animations, and the audio, as well as how they interact with other people around them.

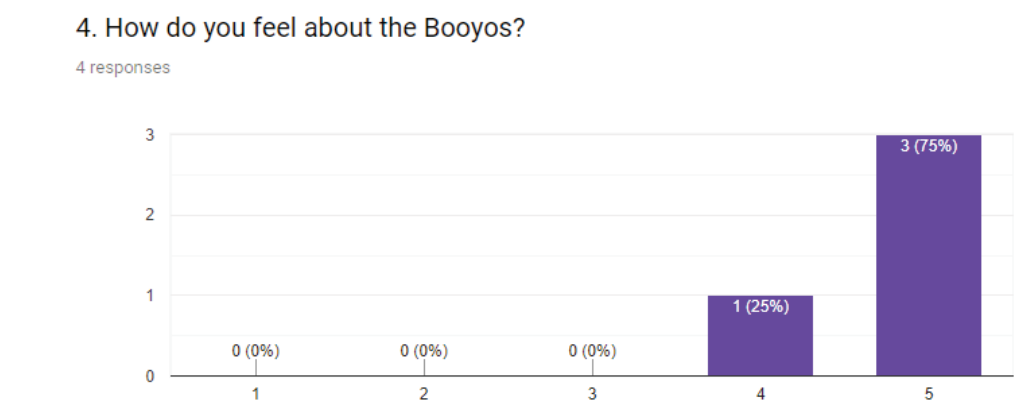
The most important thing about this playtest was that it was our first formal test with people who fit our target demographic. While we've had users from our target demographic in the past, they've been in very large crowds and while we can still get good data from those experiences, being in a more calm and formal setting will allow us to be able to ask more questions, and get more data about our playtesters and how they felt about the overall experience.



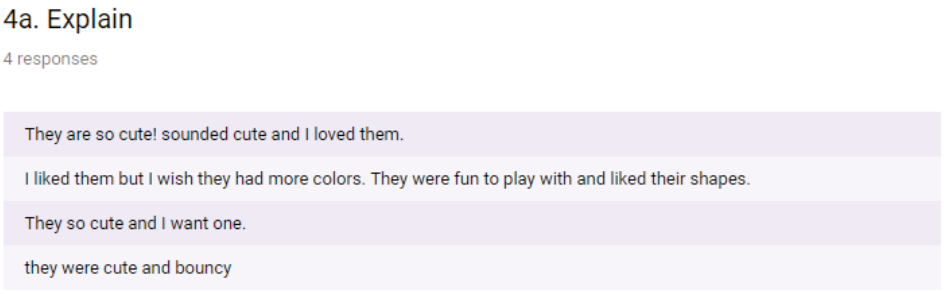
Ages of our playtesters.

Overall, they enjoyed the experience, and part of what they liked about the experience was discovering what they could and couldn't do to the creatures. It wasn't just being able to play with the little creatures, it was the process of learning and discovery they enjoy too.

They also liked the design of the creatures and what they could do with them, validating all of the testing we had done in previous semester, in which we had tested the different character designs and materials with people around campus.

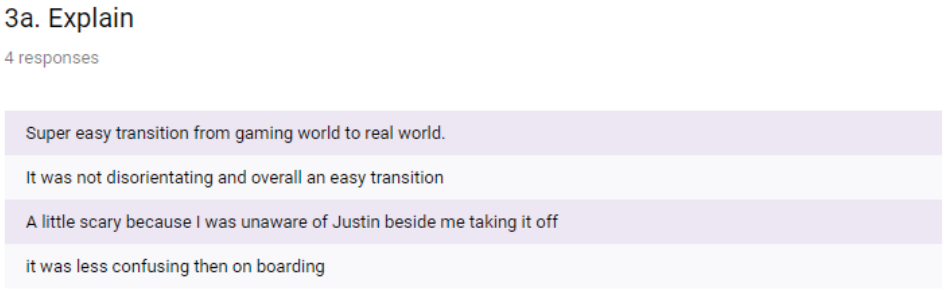


Scale of 1-5 for how much the players liked the Booyos. 1 was they didn't like them, and 5 was really liking them.



Comments from the playtesters about the Booyos.

They all agreed that the onboarding and offboarding was good, but we noticed that one of the testers was spooked when a member of the team approached them to begin the offboarding process and didn't see them. We realize now for the future that for the offboarding process that team members need to make their presence known before they begin the offboarding.



Comments about the offboarding process

Another thing we're going to change is the length of play time. Originally we had planned to limit the play time to two minutes, but based on our observations as well as the comments our playtesters made, that is too short of a time. Our playtesters suggested longer play times of around 10 minutes. We never thought that 2 minutes wasn't long enough, and I believe the reason why was because when we would playtest with just ourselves, we already knew what to do. We already knew how to play so we didn't have that period of discovery. We will be experimenting with varying play time lengths in the future.

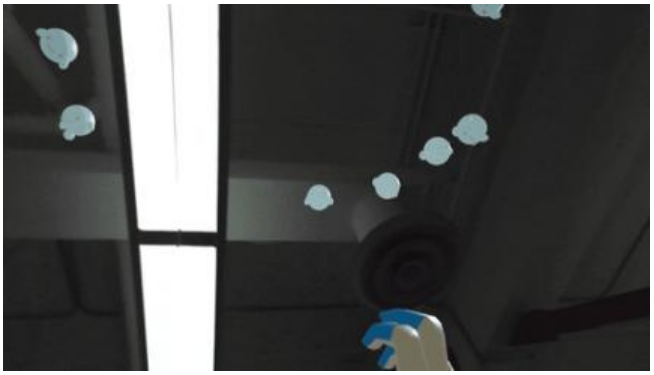
Lastly we recommend talking to the user more during the onboarding process, and making sure they are completely comfortable and know what to expect when they put on the backpack and the headset. Our playtesters were generally unsure about the backpack, with one being nervous, and it might help to ease their minds if we let them know what to expect, like how their vision might be initially blurry.

JUSTIN CAPCAP
Game Designer

MARCH 15, 2019 BY CAPCAP

Technical Dev Log – Gone Booyo Gone

For this dev log I'll be talking about yet another problem that we have been ignoring for quite some time, as usual. That problem is the Booyos (blobs) eventually floating away out of reach. This is a huge problem simply because if you can't interact with the booyos, then you don't do anything. On a more serious note, when booyos get out of reach, we found out that most players still try to reach them, some of them even try to jump with the computer backpack on. This becomes a huge issue in terms of potentially damaging the equipment. But more importantly, this is a huge UX problem, where players are forced to tip toe and exert a notable amount of effort, which can also lead to injury and just physical stress.

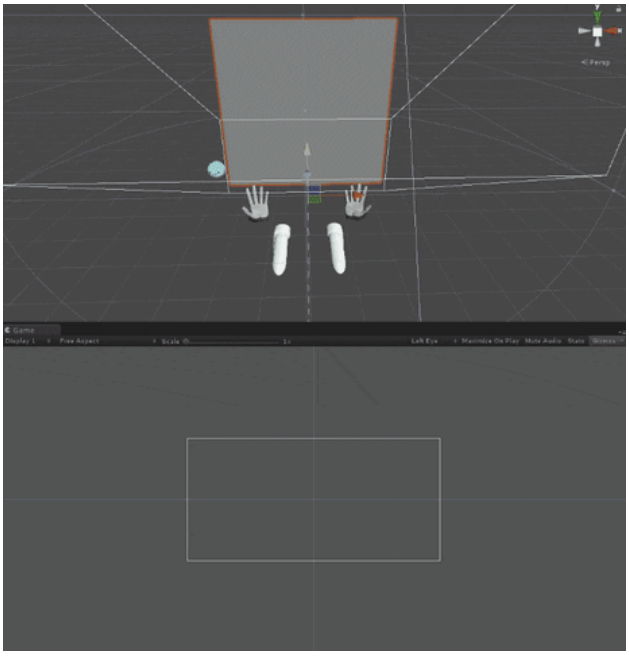


However, when we implemented the Booyo AI, we did consider a feature where they simply return to their "home" when they go out of reach. Although the booyos returning works perfectly fine, the location of the home is a completely different story.

So how we had it set up was that the home was set to their initial location as soon as the game starts or whenever we reset the game. There were 2 main problems with this.

First, the most obvious is that this is a MOBILE VR EXPERIENCE. This means that players move around the space, which also means that the home is left behind.

Second, we've been having a huge problem since last semester called Drifting. This is when the player gets displaced within the Unity scene, moving everything else away from the player. This mostly happens when the ZED mini camera fails to detect contrast in the environment and confuses what is moving relative to the real world space.

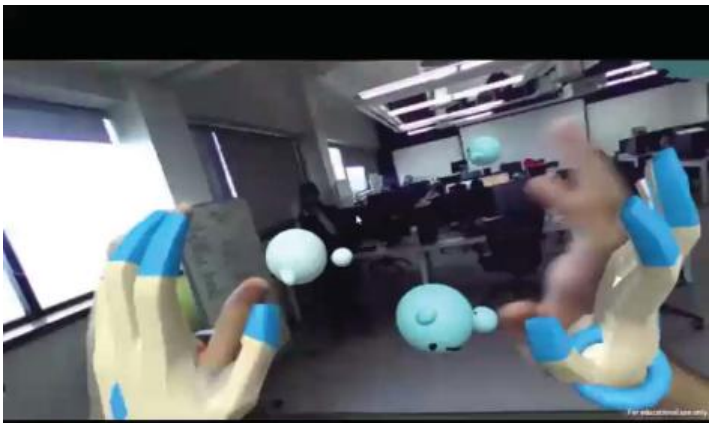


Considering how problematic this is, we weren't necessarily ignoring it. The reason why we decided to push it back a lot was because we managed to have a temporary solution. That solution was to simply reset their position relative to the player. But now that I finally had the time to go back to this, let's get on it (There's not a lot).

The solution was very simple, just make the player the home… So my job for the past week was to update our blob movement script and make it so that the blob never strays too far away from the player. I also implemented another feature on top of this where the booyos do a height check, where they return if ever they are too high up or too low under the ground. Unintentionally, I added a feature where the booyos essentially follow you around wherever you go, kind of like a cute companion!

MARCH 15, 2019 BY KEANA VICTORIA ALMARIO

Devlog #5: Animating a 3-Sphere "Model" in Unity



Gameplay footage of Booyo Park.

Because of the nature of the Raymarching Toolkit we started the project with, the team decided early on that I would be **animating the Booyos in Unity**. I didn't get too in-depth with this topic in the previous posts, but I will now! This time, I will be discussing the reason behind this decision, my workflow, the pros and cons, and the compromises I made to make way for the tech side of the project.

Why decide to model and animate in Unity?

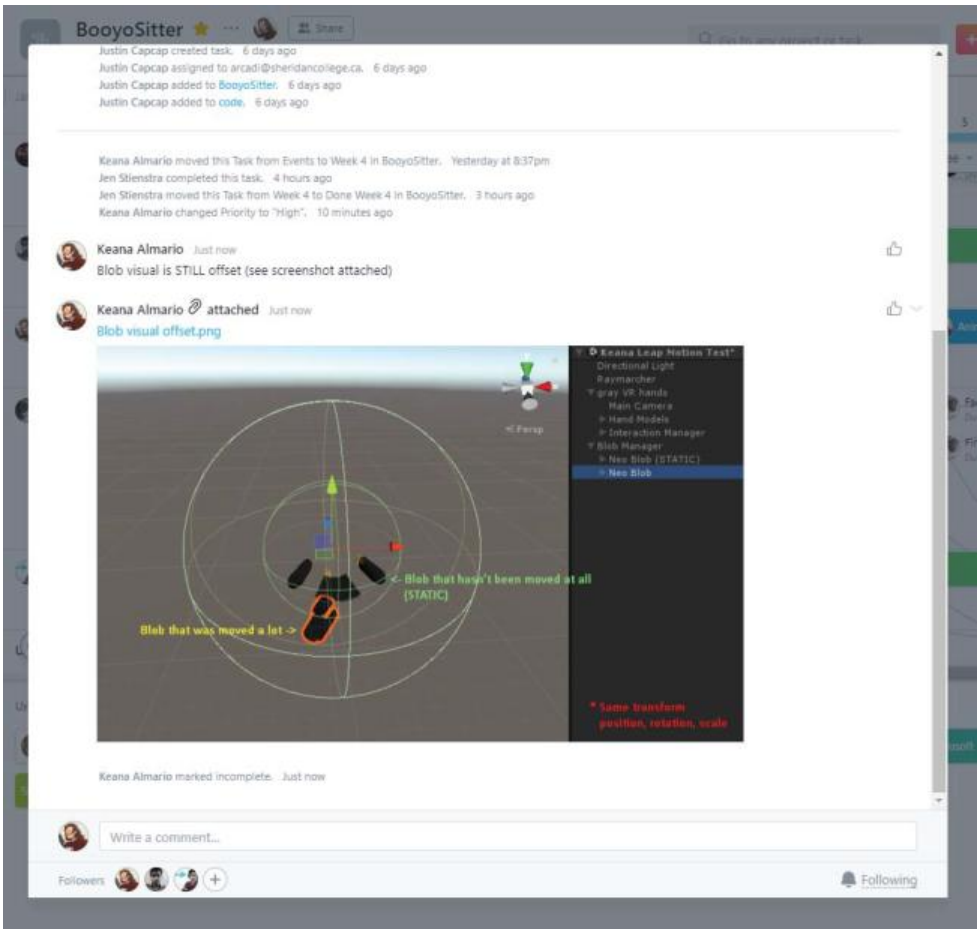
We have a proficient 3D modeller on our team. However, we decided to create the model in Unity instead. **The first reason**: Raymarching Toolkit only applies its effects onto its own geometry. Simply put, **the toolkit does *not* work on actual meshes**, like models imported from Maya. Since our character had a simple design, this was not a huge sacrifice for us — except that our 3D modeller had to find other tasks, and that I would have to take over animation since I was more familiar with animating in Unity.

The second reason: we immediately **eliminate the need for rigging** and **lessen asset import time** in our workflow. The only complex shapes we have are the faces, which are modelled in Unity. Other than that, we would not have to dedicate time to importing a model from Maya and checking if it breaks – what we see in Unity is what we get.

Animation workflow

A video of the Booyo's dancing animation, which will signify when they're about to merge together!

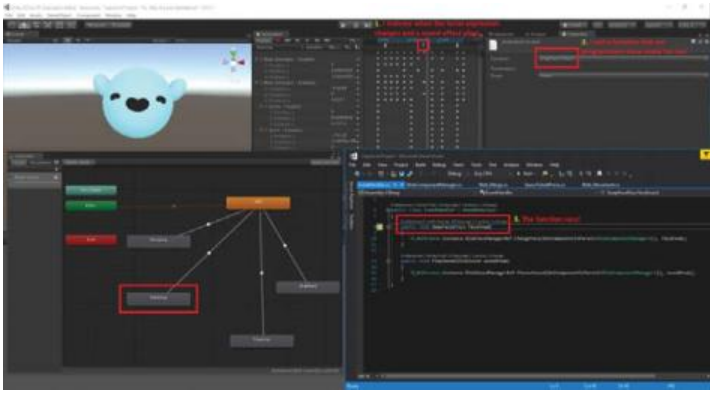
1. Since I was animating in Unity, it was very important that the structure of the Booyo Game Object worked for both me and the programmers. This meant *many* backs-and-forths, continually improving the quality of the model from both disciplines.



Screenshot of me communicating with our programmers. We needed to make sure the programmers and artists were on the same page with the Booyo model.

2. After we had settled on the structure of our Booyo, I got to animating. Since the model was in Unity, all I needed to do was to push the **.anim files** to the repo, and it would update automatically. There was a minimal chance that anything would break since everything was done within Unity.

3. Meanwhile, the programmers set up the animation system and code for me. While they waited for me to finish making my animations, they used test ones they created in Unity. The downside to using Unity is that not all properties can be animated. So, the programmers set up functions using Animation Events that let me change those properties anyway!



Screenshot of the function that changes the mesh of the face (while keeping only 1 Game Object) or plays a sound. This made it really easy to work around Unity shortcomings.

4. If any of the programmers needed any tweaking, all they had to do was call me over to their station, and we could look at the animation and edit it together.

   All in all, the workflow was pretty straightforward!

Pros & cons

Overall, I liked animating in Unity for this project. I found that:

- It was really easy for anyone to edit the animations when needed, even when I wasn't there. If anyone else in the team found a minor issue, they could easily go into Unity animation and tweak it.
- I never needed to import anything from outside Unity. This cut a lot of time in production and greatly helped the whole team in the long-run.
- Since the model only had 3 major animated parts (body and arms), animating was simple.

However, I found that animating in Unity had some drawbacks:

- I could not animate complex models. We were lucky in this project that we only had a simple model made of 3 spheres, but what would have happened if we had a more complex character? Scaling the project up using this method is not feasible.
- I could not animate the model in complex ways. The Booyos have an animation where it spins in a circle. This would have been simple to do in Maya — I would have animated the Booyo along a motion path shaped like a circle. Unity has no such thing! It became a tiring process, even if it was for only 1 animation.

Contradicting our original decision

Before I end this post, let's go back to one of the main reasons we chose to animate our Booyo in Unity. We originally did it to make way to the constraints of the Raymarching Toolkit. However, it is important to note that **we actually stopped using Raymarching Toolkit midway through production**. We did this after my devlog on compromise and optimization, where I

simplified the original Booyo model even further to make way for better framerate. It turned out that the Raymarching Toolkit did not work for our project as planned, simply because it was heavier on processing than we thought. Prioritizing our players' comfort, we decided to choose better framerate over the blending jelly effect.

At first glance, we seem to have scrapped a lot of our work. However, when we think about it, the pros of cutting Raymarching Toolkit out of our project outweigh the cons. After removing the Raymarching Toolkit from the scene, we found that the game ran much better. We also found that players were not bothered by the lack of blending effect, but significantly appreciated the smoother framerate!

Going forward...

Since we are nearing the end of production, we are now at the final stages! Going forward, I will be focusing on the showcase experience outside of the game itself.

CATEGORIES **ART**

March 16, 2019

WINDOWS MIXED REALITY PORTAL AND ZEDM CAMERA TROUBLESHOOTING

—

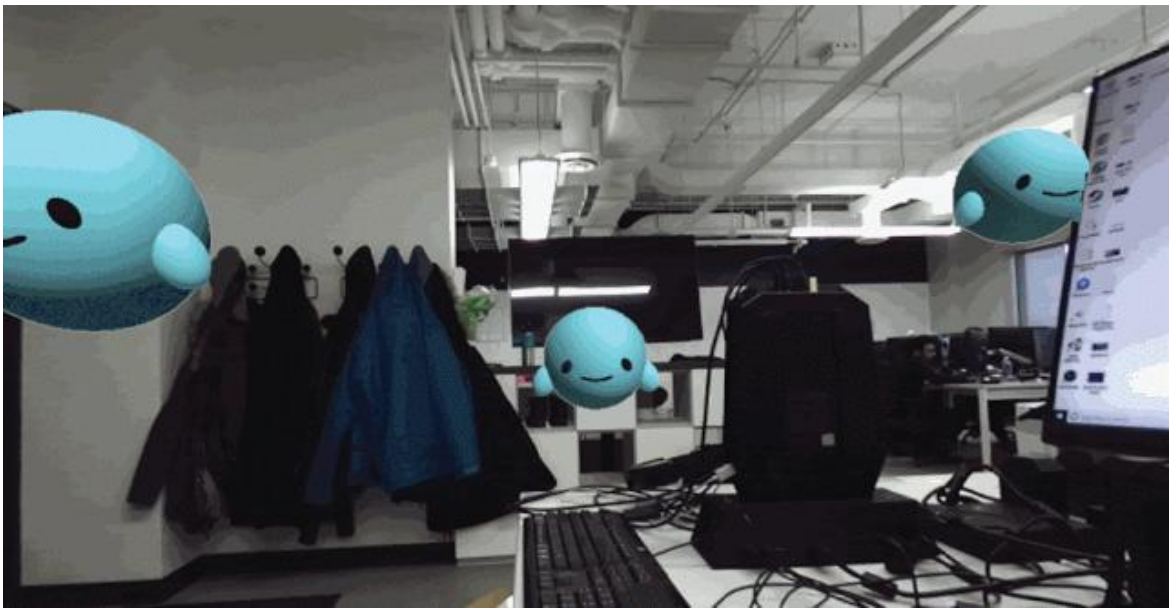
Having a bunch of things elastic'd to a headset may look neat, but working with 3 pieces of technology gave us no end of issues. In particular the ZEDm camera presented us with a number of obstacles. For example, while tracking is usually pretty good sometimes it would get slightly displaced. This would happen most frequently when someone walked in front of the camera, displacing whatever was on screen and effectively kidnapping them.

This is because of the ZED's own motion tracking. When an there's a large object in the cameras frame, the camera things that the object is actually the world and moves the things in the scene to where it thinks they should be in space. If the object is moving, then so does everything else. The first thing we did to try to get around this was simply disable the ZED's tracking.

The ZED's motion tracking is actually optional, and if you disable it the camera won't do any tracking on

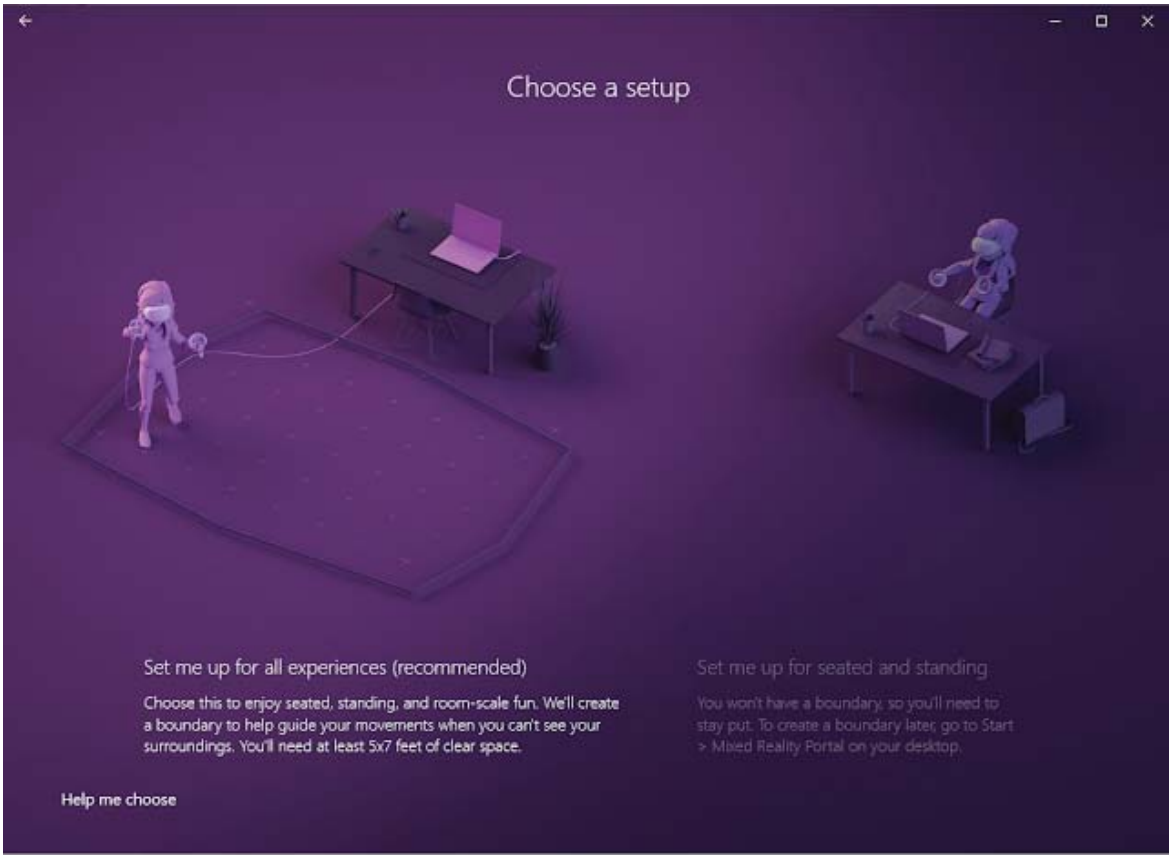
it's own, but rather use the headsets tracking. Seemed like a good idea and our tests showed that it would help us get around the kidnapping so we decided to try it out.

Of course nothing is simple with Windows Mixed Reality. While we had solved the kidnapping issue our spatial tracking wasn't working working any more, meaning even if you moved through the world the in game camera stayed in the same spot.



This resulted in everything being just slightly out of reach and and as you frustrated players to no end. After a lot of scratching our heads we found something of an answer in the Windows Mixed Reality set up. When you plug in your HP Windows Mixed Reality (HPMR) headset in for the first time you're given a series of steps to set things up. One of these steps is setting up a boundary for your play space.

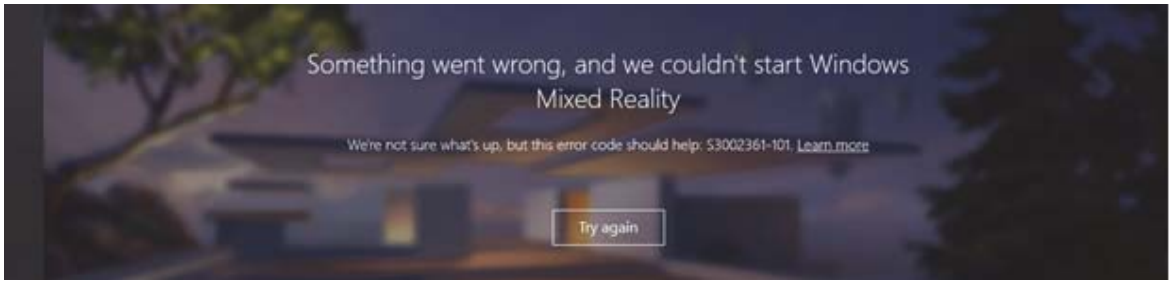
Previously when we did this we set up for seated experiences because we didn't have a whole lot of room in our workspace and it seemed to work fine without setting up a boundary so we didn't think too much of it.



I don't think we ever managed to find a clear answer online anywhere, but from our tests it seemed like in order for the HPMR headset's spatial tracking to work we needed to have a boundary set up for standing experiences. If I had to guess I would say that this is due to the headset having inside out tracking without having any base stations compared to how the how Oculus or Vive have both external sensors.

Switching over to standing experiences *sort of* worked. It worked sometimes, but we found that more often than not it wouldn't. This was usually due to the boundary we had set up being erased or deleted, which seemed happen whenever we turned off the system. It was also a headache to troubleshoot the thing because a lot of the time you would find answers for the HoloLens, which is *also* Windows Mixed Reality and to my understanding uses some of the same stuff as the headsets that we have.

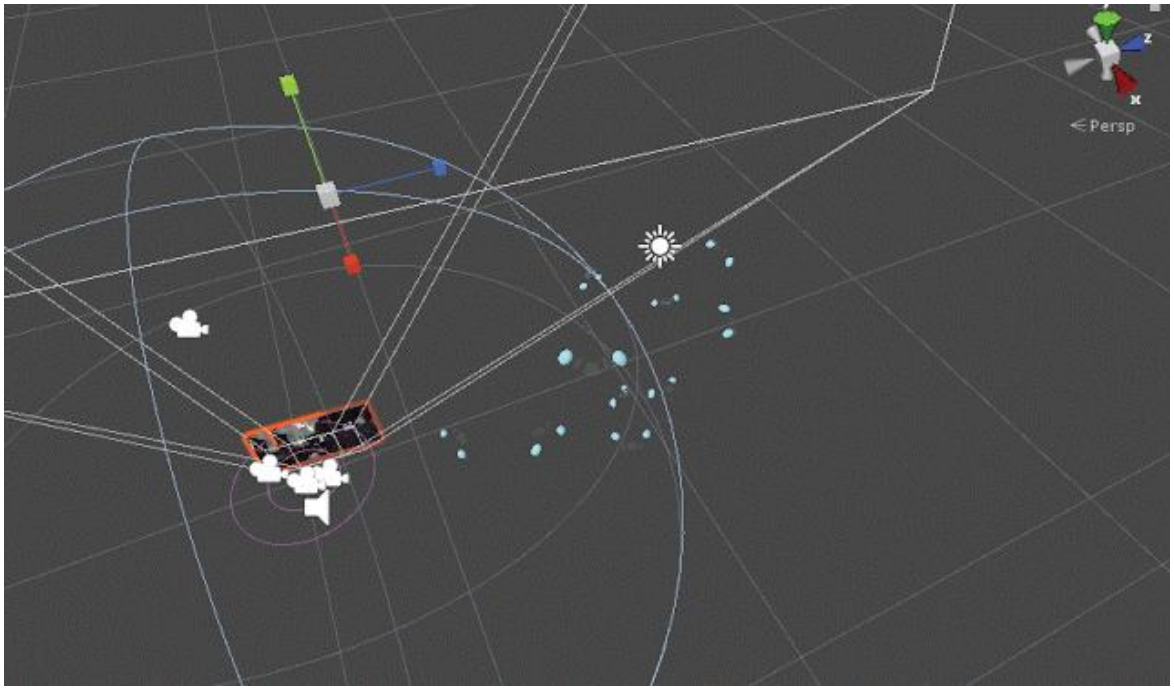
It didn't help that the Mixed Reality Portal would crash sometimes and give us an error code that didn't mean anything. We eventually found out that this was because of the version of Windows that we were on, and most of the issues we ran into were resolved when we upgraded from Windows 10 version 1803 to version 1809.



Even after we updated Windows versions we were still having issues with the headset's spatial tracking, and our efforts to find answers hadn't gone anywhere. At this point I figured that if relying on the HPMR headset's tracking was going to give us just as much trouble as relying on the ZED's tracking we might as well try looking into the ZED again since we were getting nowhere with Windows.

This brought us back to the initial issue of kidnapping. My first idea to get around this was simply to give players the ability to reset the scene so that they could deal with kidnapping and drifting once it became an issue for them. I had tried this previously by just reloading the scene but many of the assets we were using use DontDestroyOnLoad(), which meant that reloading the scene would create duplicates which caused no end of errors.

This time instead of resetting the scene I figured I would simply set everything back to its default state. This worked for the most part except for one tiny thing:



Resetting everything caused the in game camera to rotate about 90 degrees. With no idea why this was happening I sent a message to Stereolabs, the creators of the ZED camera who had been helpful so far. What we ended up doing was making the camera rig a child of another object then, after we reset the

camera by enabling it and disabling it using the built in ZED methods, we would set the parent transform to have the inverse of the camera rig's position and rotation.

This worked out, but as always solving one problem only leads to another and now our scene was doing this:

This isn't normally the kind of thing you want to see, let alone in a game with a headset where you have to worry about potentially making players sick. We're still dealing with this issue, and from my back and forth's with the guys at Stereolabs it seems that it might have something to do with the camera's IMU calibration. For the time being though we've moved to a new computer with a 1080 graphics card instead of a Quadro P5200 and it seems to have xed the issue for now.

DEVELOPMENT LOG OF YANI WANG

A place for me to document my experiences being a game designer and 3D artist.

MARCH 13, 2019 BY YA NI WANG

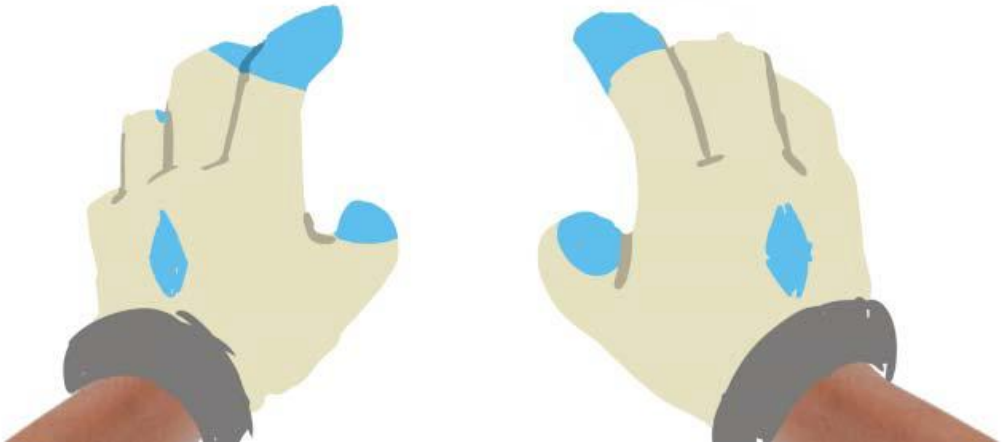
Development Log #5

Ok, so now its officially March. We now have about less than a month until the semester is over and our projects will come to an end. Since Jen, James, Keana and myself are all going to GDC next week, we'll have even less time to finish up the project. However, I am glad to say that things are overall going very smoothly.

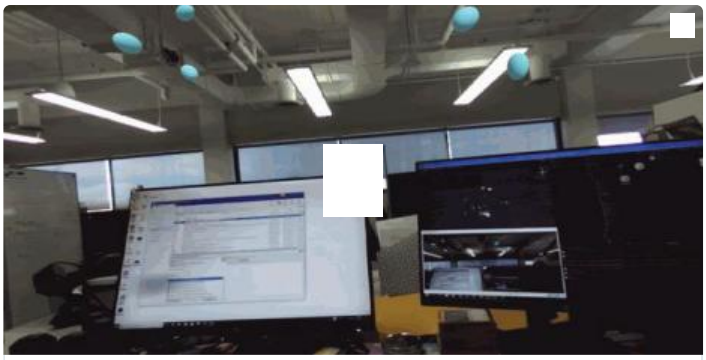
Since the last update, we've changed some things up. Our game is now called Booyo Park, which was actually our original name before BooyoSitter. We decided to change the name because we've also changed up the premise of our game. We scrapped King Booyo, and now the premise is just that Booyos is a magical creature that exists in the world around you, you just need our special tech to see them. Booyo Park is a place where you can interact with the Booyos. Therefore, since we scrapped the whole "taking care/babysitting" aspect of the game, we changed the name back to Booyo Park.

I also added in a custom texture for your hands in Leap Motion, so they're no longer just the default grey hands. James drew up some concept art for them, and then we all picked our favourite design and I added the texture in. They look pretty cool in the game if I do say so myself. We also got some great feedback on them from playtesters, who said that the gloves helped them believe they were in a "magic cartoon world" where they could interact with the Booyos.

Booyositter - Hand mockups



This is the concept art James drew of the Leap Motion gloves. I based the texture off of this drawing.



Hexabyte! @ LevelUpTO
@hexabytegames

Whoa, those are some pretty spangly fingers, don't cha think? 😃 🖐 Featuring the Zed Mini camera by @Stereolabs3D and @LeapMotion

13 9:30 AM - Feb 14, 2019

See Hexabyte! @ LevelUpTO's other Tweets

We've also been busy doing a lot of things for our project outside of the game. I mentioned in my last update that our Twitter was up and running, and we've been posting regularly. We almost have a hundred followers now, which is great because our goal is to have people recognize us and our game before we start showing it at conventions and other places. Check out some of our tweets here:

Tweets by @hexabytegames

Hexabyte! @ LevelUpTO
@hexabytegames
Replying to @hexabytegames
See us (and the Booyos around you) at @LevelUpTO #LevelUpShowcase2019 on April 17th! 😊

3h

Hexabyte! @ LevelUpTO
@hexabytegames
We at Hexabyte! are working on #BooyoPark, where you walk around freely & use your hands to play with Booyos. Pick them up, throw them around, merge them together, & watch them pop! #gamedev

Many thanks to @sheridangames, @shadowfactoryvr, & @HPCanada for making this possible 💖

3h

Hexabyte! @ LevelUpTO

Embed View on Twitter

Also, I finished our website and it's now up and running! Feel free to take a look at it here: https://hexabytegames.wixsite.com/hexabyte

On the topic of branding, I was comparing prices from various websites to print promotional art for our game when I found out that Vistaprint was having a 40% off your entire order sale. Needless to say, I spent the next 48 hours furiously designing our promotional art so I could take advantage of the sale. Everything worked out, and we've already gotten our promo stuff in!

This is the mockups of our promotional art. Not pictured are also matching Booyo Park t-shirts. Everything's come in and it all looks great.

We also had some guests from Ubisoft Toronto visit and try out Booyo Park! It was super exciting. They had really nice things to say about our game, and it was cool to see them experience MR and Leap Motion.

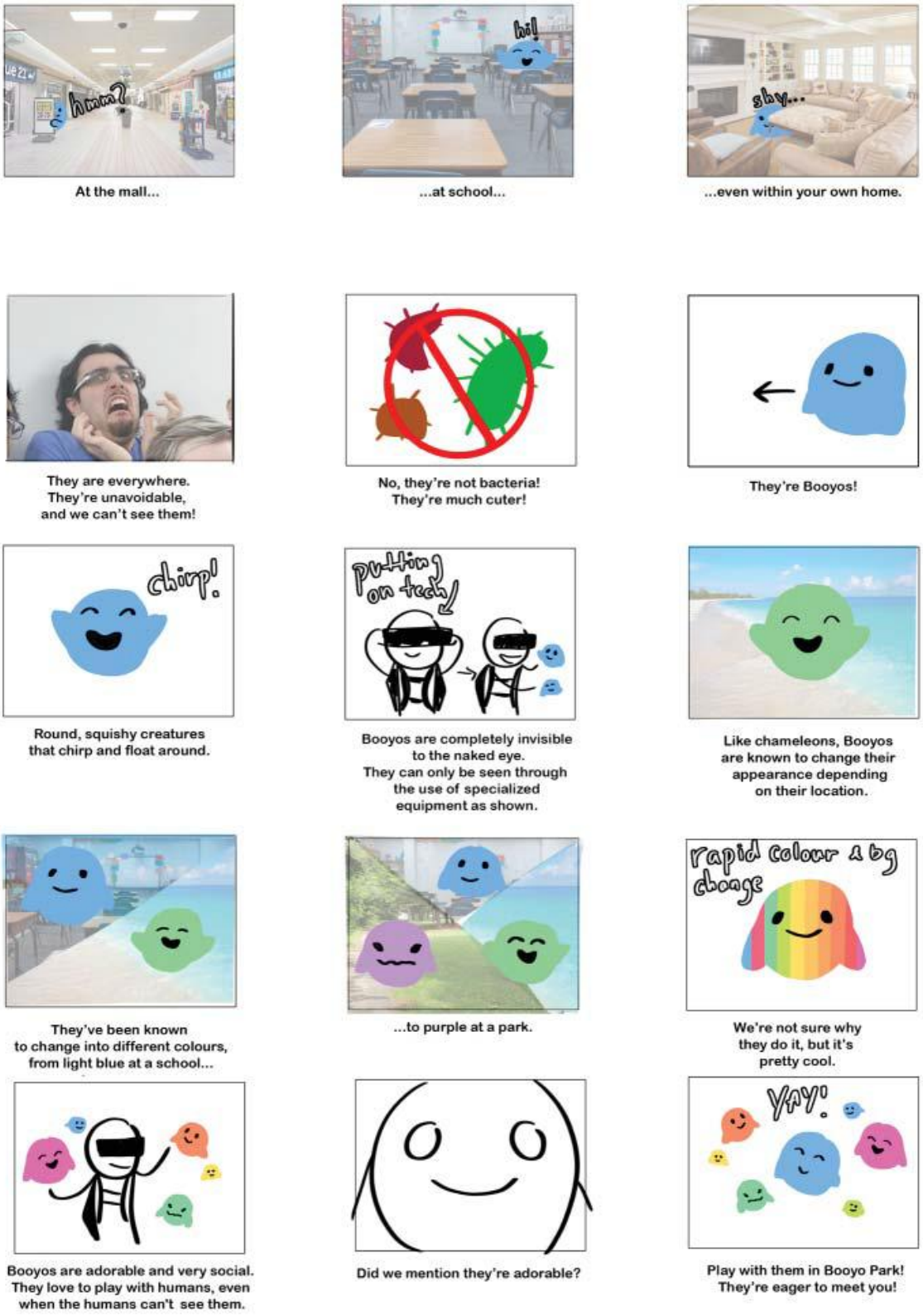
Hexabyte! @ LevelUpTO
@hexabytegames

Happy Tuesday! We want to give a big thank you to @ArchaicJohn, @AaronSquaron, and Sean Storey from @UbisoftToronto who visited our workspace and played #BooyoPark yesterday @sheridangames 😊

13 2:37 PM - Mar 5, 2019

See Hexabyte! @ LevelUpTO's other Tweets

The main thing I'm going to be focusing on for the next few weeks (aside from GDC) is creating an onboarding video for our game. I drew a storyboard for this video, but basically, its a video we're gonna have running on a loop at our booths at conventions that will introduce the concept of Booyos as well as the premise of our game. It'll give people something to do if they're waiting in line to try our game or just as something to look at.



The storyboard for the onboarding video. It's since been revised to flow a little better based on feedback I got from Jon, my art mentor, but overall it's *still the same.*

I also spent some time storyboarding the actual onboarding offboarding experience for the players. Often times, a lot of people can find VR games intimidating to get into since there's a lot of unfamiliar technology and a sense of the unknown. It goes double for our game since we have a lot of unfamiliar technology, with the backpack and Leap Motion and Zed M camera rubberbanded to our headset and all. Therefore, we want players to feel reassured and comfortable, and we want the onboarding and offboarding process to be as pain free and stress free as possbile. Everyone on the team has different roles theyre gonna play, and hopefully, this will help us stay on track and running smoothly under the stress of everythign at conventions.

The storyboard I drew for onboarding/offboarding experience.

Needless to say, we've been busy! And even as this project draws to a close, we still have a lot to do, even though it definitely feels like we're on track and working hard. Recently, I've been realizing just how grateful I am about being apart of this team. We not only work well together, but we also have a ton of respect for each other. We're still all great friends, and I know that whatever comes up, we can deal with it. It's not something a lot of people can say, and I'm extremely grateful that I can come to school every day and still be not only excited about what I'm creating but excited about seeing the people I work with. I have a lot of confidence in this project, and I'm excited to see what comes next (including GDC!)

Appendix G: Prototyping Notes

These notes were ones we made during our **initial design period.** We were still unsure of the direction we wanted our game to go, so many of these are notes reflect our **brainstorming process**.

Hexabyte Games Ideas

Combined List:

Drawing (w/ hands/wands)

- Keep Drawing and Nobody Explodes

Job Sim (cooking/assembly line)

- Santas Lil Workshop
- Cooking Murder
- Lil Alchemist

Moving Physical Objects

- Path Building w/ Physical Objects
- Puzzle Cube

Moving Virtual Objects

- Cat Stacking
- Catching Fish / Saving Fish from Oil Spill

Asynchronous Multiplayer

- Though Bubbles
- Thief Puzzle Game
- Giant Hands (Bongo Bongo)
- Human Tetris (Hole in the wall?)

Escape Room

History/Learning Hologram

Falconer VR

Life Sized Rube Goldberg Machine

Retired Boxer Moving Co.

God Game

Josh's Outlet Game

Platform Dungeon Crawler

AI Companion

MR Detective

Herding Game

Sign Language Game

General Game (Commanding Officer)

3D Splatoon

Covering Objects to make them Disappear

Disjointed Hands

Obstacle Course

Naruto Game

Pirate Captain

3D Pictonary

Human Voltron

Boxing Coach

Little Creatures (Lemmings XR)

Haircutting w/ Magic Leap

Attack On Headset (Non headset ppl are attacking person in headset)

Commander (Person in headset is leader of army)

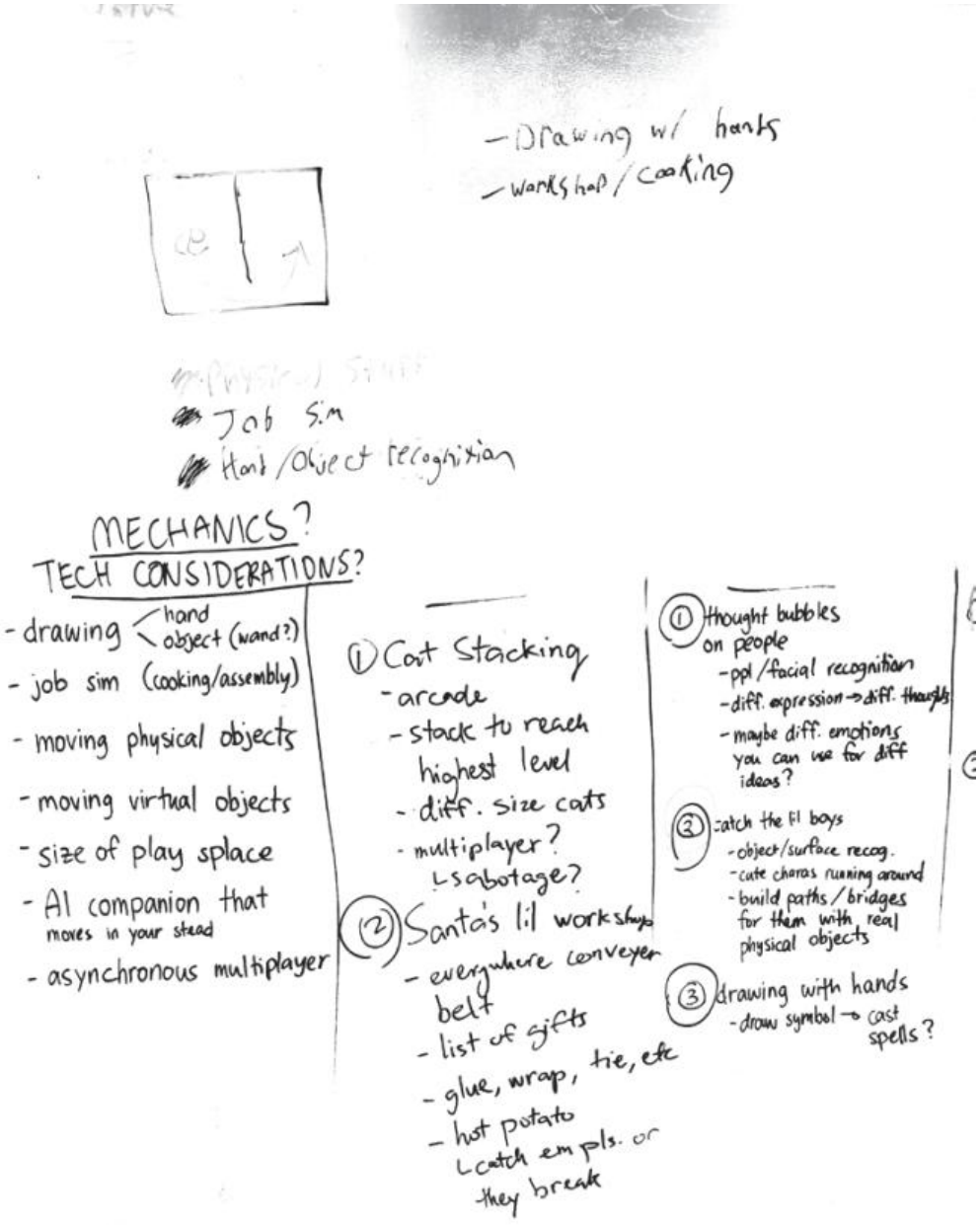
Werewolf Bluffing game

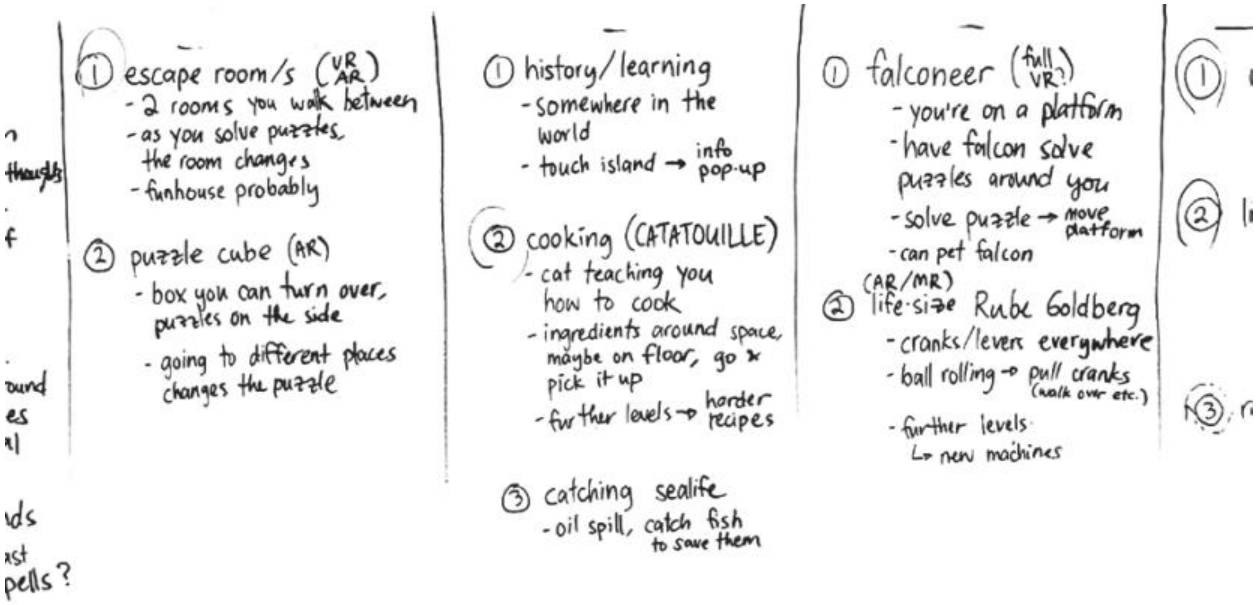
Ghost Hunting (Like wizard game)

Busted Pipes

Guess Who

Meeting: September 13, 2018




① escape room/s (VR AR)
- 2 rooms you walk between
- as you solve puzzles, the room changes
- funhouse probably
② puzzle cube (AR)
- box you can turn over, puzzles on the side
- going to different places changes the puzzle
① history/learning
- somewhere in the world
- touch island → info pop-up
② cooking (CATATOUILLE)
- cat teaching you how to cook
- ingredients around space, maybe on floor, go + pick it up
- further levels → harder recipes
③ catching sealife
- oil spill, catch fish to save them
① falconeer (full VR?)
- you're on a platform
- have falcon solve puzzles around you
- solve puzzle → move platform
- can pet falcon
② (AR/MR) life-size Rube Goldberg
- cranks/levers everywhere
- ball rolling → pull cranks (walk over etc.)
- further levels
L→ new machines

Concerns:
- portability
-

AGENDA

- [x] present ideas
- [ ] pick top 3
- [ ] decide on team name?

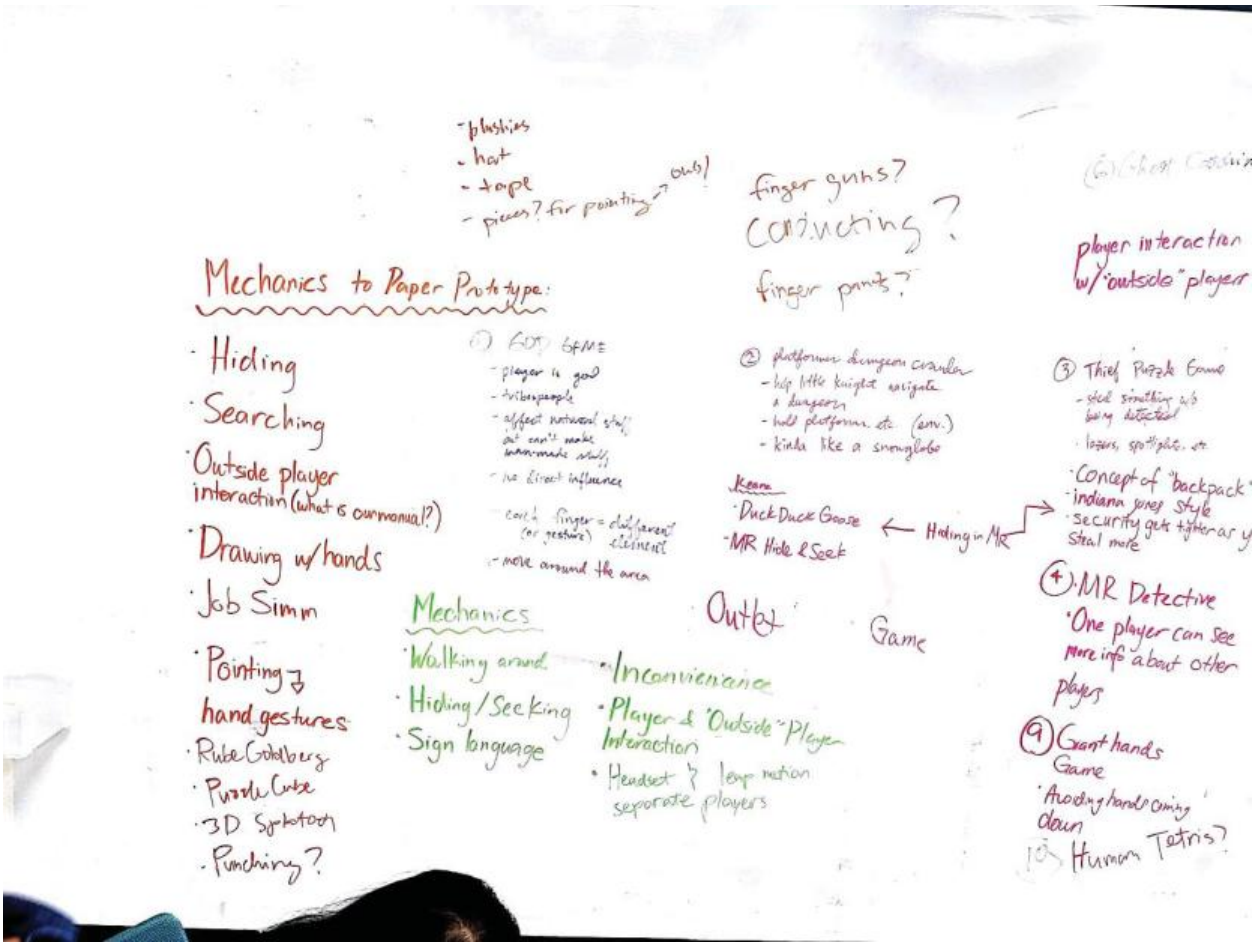
1. falconeer (full VR?)
   - you're on a platform
   - have falcon solve puzzles around you
   - solve puzzle → move platform
   - can pet falcon
2. (AR/MR) life-size Rube Goldberg
   - cranks/levers everywhere
   - ball rolling → pull cranks (walk over etc.)
   - further levels
     ↳ new machines

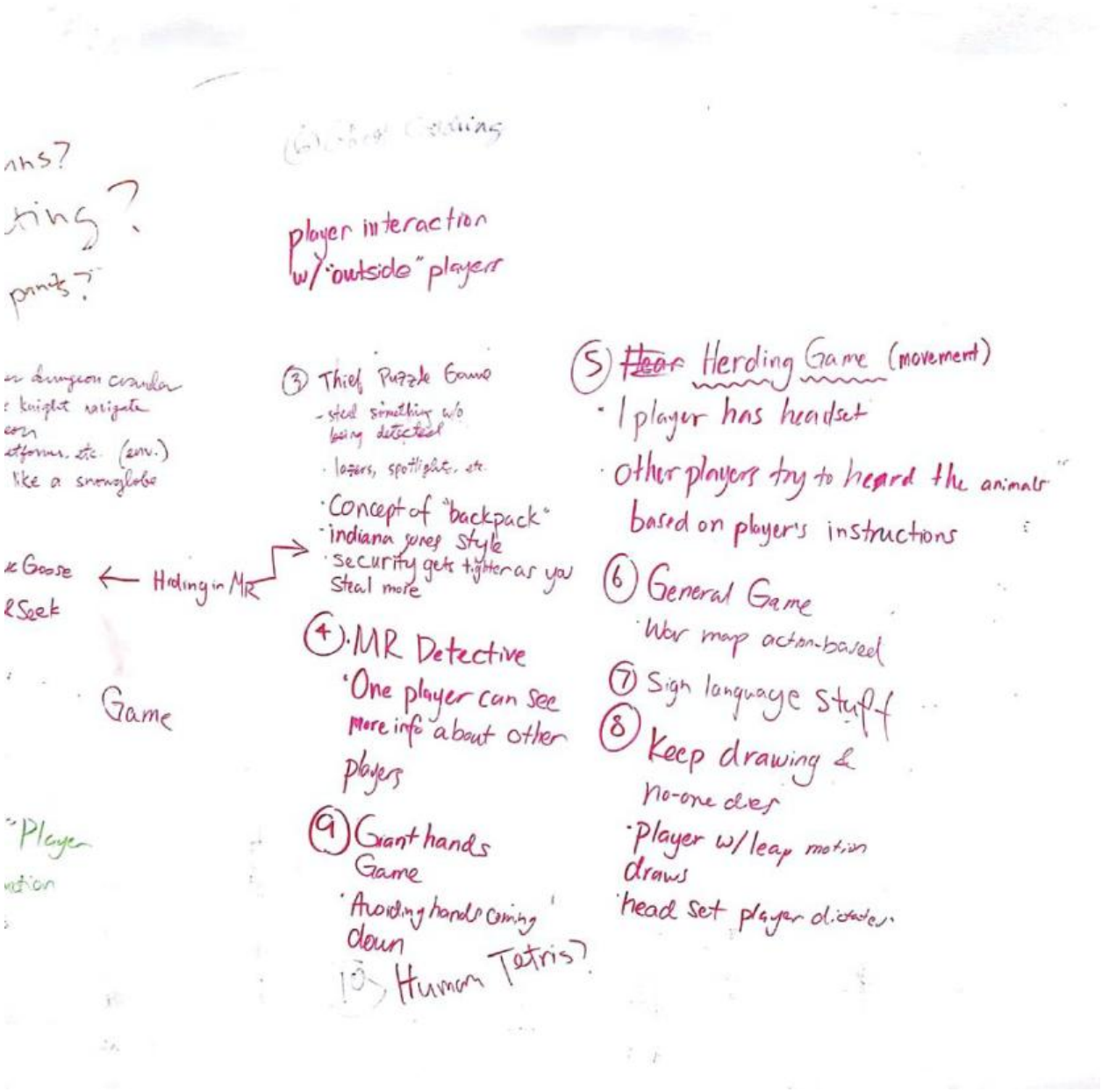
1. cooking murder
   - get orders
   - kill customer ???
2. little alchemist
   - making potions
   - different kind of potions
   - maybe a stick you hold = wand and a book w/ recipes
3. retired box in moving company
   - punch to move things
   - change punch strength based on material (eg. glass)
   - different kinds of punches (eg. uppercut)

things we need to test in the future
1. hand recognition

↘ getting into it?

Meeting: October 1, 2018





Playground Games used as examples

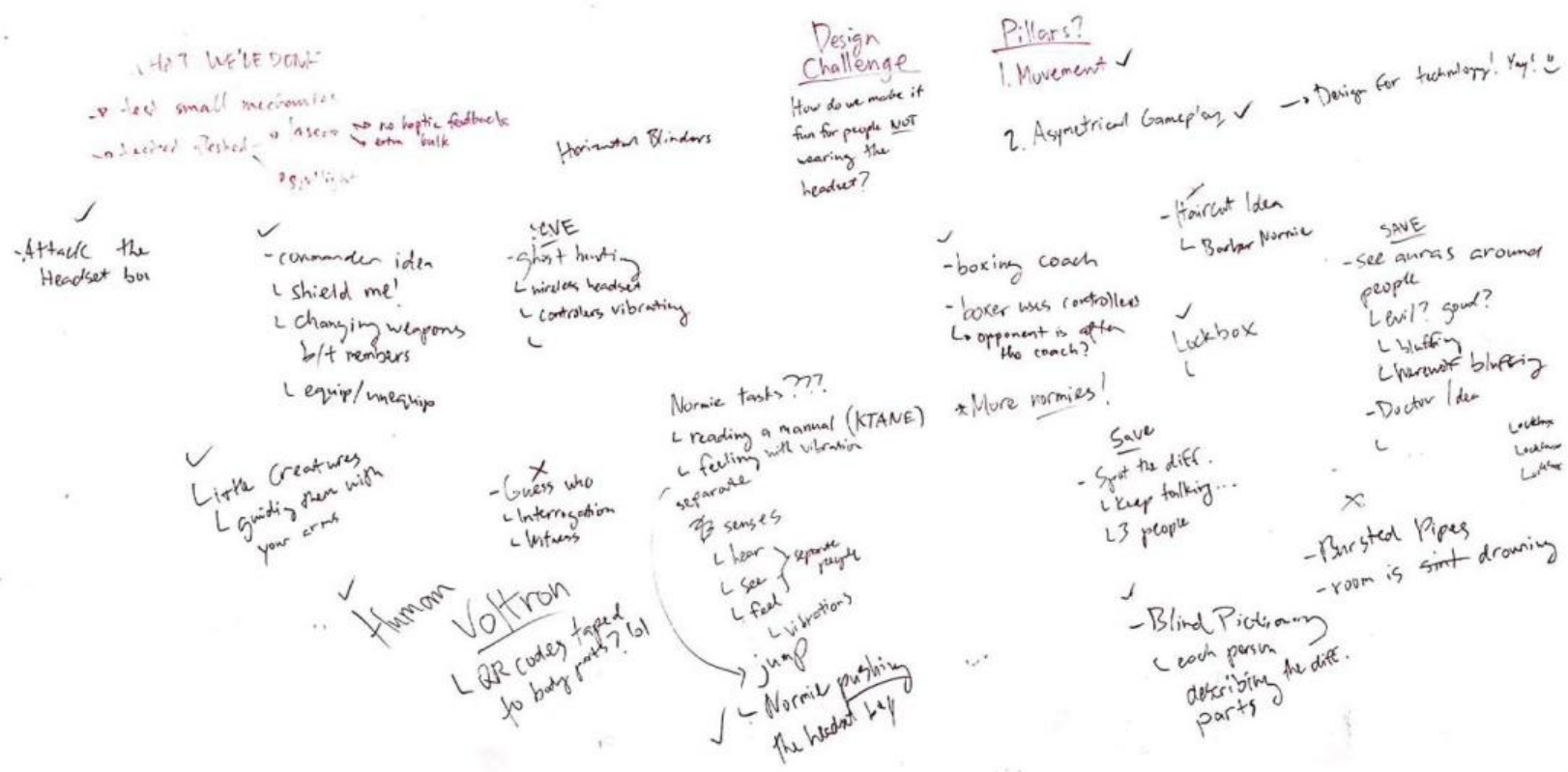
- Marco Polo
- Red Rover
- Dodge Ball
- 7-Up
- Red Light, Green Light
- Human Hungry Hippos
- Flag Football
- Musical Chairs
- Ultimate Ninja

- Triangle Tag

Not Tested on October 4th, 2018

- Musical Chairs
- Hiding Stealth Game
- Obstacle course
- Spy game -> laser game
- Human tetris idea

Meeting: October 9th, 2018



Blind Pictionary

- One big picture
- Each person has different parts of the picture
- Non headset people can form the puzzle or not
- Different perspectives are seen in the pieces
- OR
- Add a third person, the one who will guess
- So you have people forming the puzzle, headset person drawing, and the one who guesses

Human Voltron (skip for now)

- Other people have the different weapons (their limbs mostly)
- Need to “combine” with the headset person
- OR
- Non headset can look for other parts

Boxing coach

- The headset person is the coach
- He’s instructing the person with the controllers where to punch
- Vibration feeback (damaging and getting hurt)
- Sound feedback

Little Creatures (Lemmings XR) {test w marbles?}

- Player guides smaller creatures using their arms as platforms.
- Like Lemmings
- But in real life
- It sells itself

Lockbock

- A physical box that players are trying to unlock.
- Players need to use a combination of both real and virtual clues to open it
- Lockbox provides a physical object for non headset players to interact with

Haircut

- Headset person is cutting the hair of other people using Leap Motion

Attack on Headset

- Player with the headset plays as a boss
- Non headset players work together to defeat him by shooting fireballs and doing other stuff with the controller

Commander

- Player with headset is leader of army
- Non headset players are warriors and use controllers to fight and defend.
- Adam shat all over it

Werewolf Bluffing

- Bluffing game where each player has a role
- Headset player has additional information
- Look into bluffing games/games of deception

Ghost Hunting

- Similar to wizard game

Busted Pipes

- Players have to stand in position to cover up holes in burst pipes
- Only headset player can see where the holes are.

Guess who

-Like werewolf but with a crime scene interrogation

Post Meeting notes

- Headset person is thief
  Regular person helps thief with an overview map of the place, and hack things to open things up for thief
- Headset person is soldier, describes monster to others
  Regular person has monster encyclopedia, tells soldier how to kill monster
- Headset person is Ripley in Alien, in a ship
  Regular person has map / floor plan and navigating headset person, maybe has cooldown/battery?
- Headset person is in a building
  Regular person is holding physical thing (building/blueprints)
- Headset person is ghost hunter
  Regular person has info on the ghost to lure it out
- Headset person is the mechanic on the ship (person doing the puzzle)
  Regular person regular people are different roles, each has a manual (people solving the puzzle)

Hexabyte Games Prototyping Report

Playground games for examples:

- Marco Polo
- Red Rover
- Dodge Ball
- 7-Up
- Red light, Green light
- Human Hungry Hippos
- Flag Football
- Musical Chairs
- Ultimate Ninja
- Triangle Tag

Game Mechanics Tested

- Drawing
- Pointing
- Searching
- Commanding AI
- Racing Against time
- Obstacle course/ “Frogger”
- Solo Ball
- 7 Up
- Red Light Green Light

Drawing

- Works well but would have to be paired with another mechanic
- Doesn’t promote our main pillar, which is moving around
- Drawing with a timer was stressful

Pointing

- Player points at objects to get them to move
- Would work fine as mechanic but would need to be paired with something else
- Doesn’t promote our main pillar
- Pointing isn’t so bad, but picking up the object is preferred

Searching

- Backpack did slow down movement a little because player is conscious of it

    - Doesn't feel limiting though
- Carrying too many objects at once gets difficult
    - Can change it so the object disappears once they pick it up
- Can be a mechanic on its own and have a game idea built around it
- It's FUN and ENGAGING
- Not too tiring
- Fun racing against time

Commanding AI

- Only reason it was fun in prototyping was that the AI was another person
- Player preferred to just do the actions themselves than command an AI

Obstacle Course/Frogger

- Promotes main pillar

Solo Ball

- Would need to be paired with another mechanic
- Doesn't promote main pillar

7 Up

- Exhausting
- Not as fun as some other mechanics

Red Light Green Light

- Works well with another player if we decide to have asymmetrical multiplayer
- Follows pillar really well
- Has potential if paired with another mechanic

Refined Ideas to Move Forward With

- Spy game in which the player avoids lasers and unlocks safes (obstacle course, utilizes the space)
    - Avoiding lasers
    - Maybe hacking systems around the room? Or just moving towards each end?
    - Spawning new level or new lasers when you reach the goal
    - Moving lasers?
- Thief multiplayer game in which one person is the thief and one is a security officer

    - Thief player has the backpack and leap motion, other player has a button that turns on a camera that can only be on for a few seconds and has a cooldown
    - Thief cannot move while the camera is on
    - **Added Oct 5**: Player with headset now manuvers around lasers while the player with the camera tries to catch them in awkward positions.
- Stealth Game
    - Avoiding spotlights
    - Hacking machines around the room?
    - A combination of the ideas above
    - **Added Oct 5:**
        - Lights “patrol”
            - More fun if the player has to keep in mind where the lights are going
        - 3 or 4 designated “areas” where the “treasure” might be so that the player at least has a goal instead of just roaming around

Questions to Ask

How to navigate around the space? Back and forth? Going to specific parts of the room? How to utilize hand gestures?

Research Summaries

Hands On

- **Rec Room**
  - Motion matters, you can play this game by either teleporting or by using the control stick on the wand to move. When shooting, using the control stick is preferred but it made me extremely sick doing so.
  - Interesting UI, pause screen is a watch on the player's left hand that they can access just by looking. Might be good for implementation (Have player interact with objects the same way they would interact with them in real life??)
  - Shooting is fun. I know one of our core ideas is stay away from shooting but I think it's the aiming that feels right. Viscerally rewarding when you land a shot that was done with your own sense of aim.
  - Standing in one place is fatigue inducing. I found games where I didn't have to move I got tired of a lot quicker than ones where I had to move
- **Waltz of the Wizard**
  - Open experience, rules but not in the sense of player progression
  - Conversely, can lead to confusion
  - Ex: landed in an extremely spooky area with no idea of how to get out
  - Coolest thing: fireballs from hands. You basically lob explosive fireballs that you build in your palm first. SUPER FUN
  - Size changing spell: be careful with size changes because it is disorienting
- **The Lab**
  - The more intractable the world was, the more engaged I was
  - Robot dog was really cute and served a purpose. If I threw something, it would fetch it for me. Pet sim?
  - Two "shooting" games, bow and arrow and slingshot. Bow and arrow is 100% more fun. Much more feedback and visual information than the slingshot.

GDC Talks (I'll include links)

- **'Rick and Morty: Virtual Rick-ality' Postmortem: VR Lessons * Burrrp* Learned**
  - Zone-based teleportation: allows user to teleport to zones around a space as opposed to anywhere they want. Prevents situations where objects might be outside the players field of play (in a wall, outside camera area, etc) because the zone is built around the player's space
  - THEY ALSO USE THE WATCH THING!!!

- Gated puzzles and experience in a VR sandbox
- For things that need a secondary input (holding a gun and firing), they just made it automatic
- Used Puppetmaster plug-in for character IK's (I know we probably don't wanna touch it, but I just want to put stuff for everything)
- Set up each zone for front, left, and right interaction due to facing camera.
    - Doesn't directly apply to us, but we could use this way of thinking. Where is the player going to be when playing and how do we make sure that they stay there?

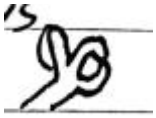
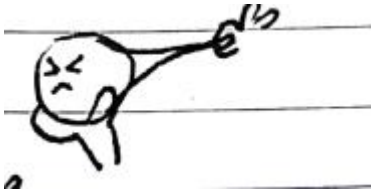
- **Matrix vs Pokemon GO**
    - "Follow the White Rabbit" – true narrative space (?)
    - Narrative spaces = create a series of emotions
        - "give me feels for more than 15 minutes"
    - "The world itself is a genre, and interaction with the world is the game"
        - Job Simulator is a good example of this
    - Depth makes the game play
        - If an action can take place on a 2D screen, then it shouldn't be in MR. Z-axis has to be taken advantage of
    - Ability to recognize objects, give it a role to play
    - She talks about in-game objects/characters reacting to the real world around them
        - Pikachu bouncing up and down on your bed while you try to catch him in Pokemon GO
    - WAY out of our scope, but an interesting theory
    - Dynamically reconstruct a room to tell a story
    - Brings up game called Fantastic Contraption, maybe worth checking out?
    - **A lot** of this is narrative based, so Jen might want to check this out. Narrative space is a big hot button term in this talk

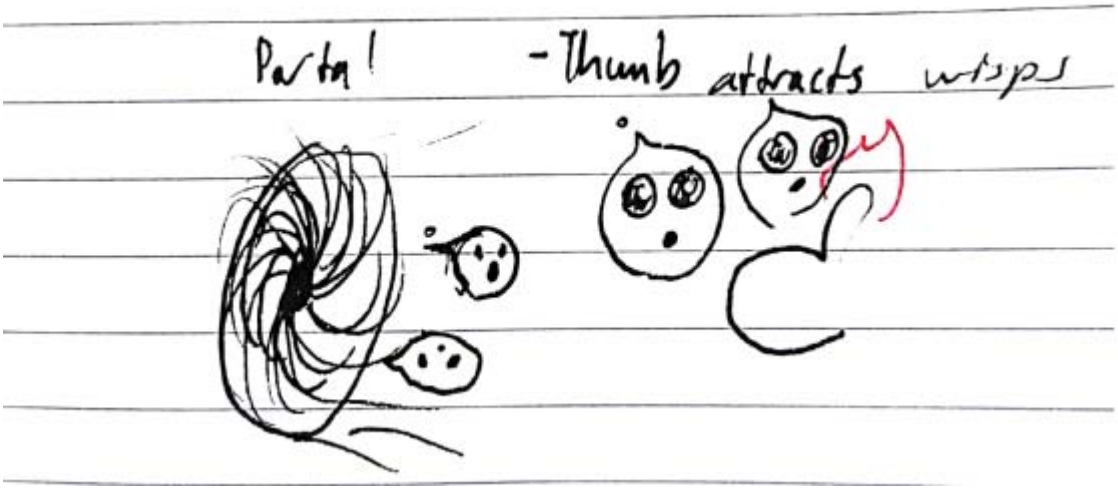
10_30_18 Prototyping Notes

These are transcribed notes originally taken in late October when the initial concept of interacting with will o wisps was established. The following notes are ideas for different potential interactions with the wisps that we tested. Those wisps would eventually become the Booyos we see in Booyo Park. Some of the interactions were kept in the final product, like merging and the creatures getting bigger.

Interactions

- Commanding with finger
- Collecting them
- Merging wisps
    - Big boy with puppy eyes
- 

- Make paths
- Trap in bubbles
- Poke to pop big boys (blobs)
- Make new wisps with hand gesture
    - 
- Fan with hand
- Slingshots with tail
    - 
- Make portals with chopping
- Wave to make wisps friendlier
- Middle finger makes all the wisps gasp



- Thanos snap: half of the wisps turn into bananas (throwback to our tojam game, Appeeling Personality)
- Fire can inflate wisps
  - 
- Devil horns: headbanging
- Clapping deletes wisps

Will-o-wisps prototype

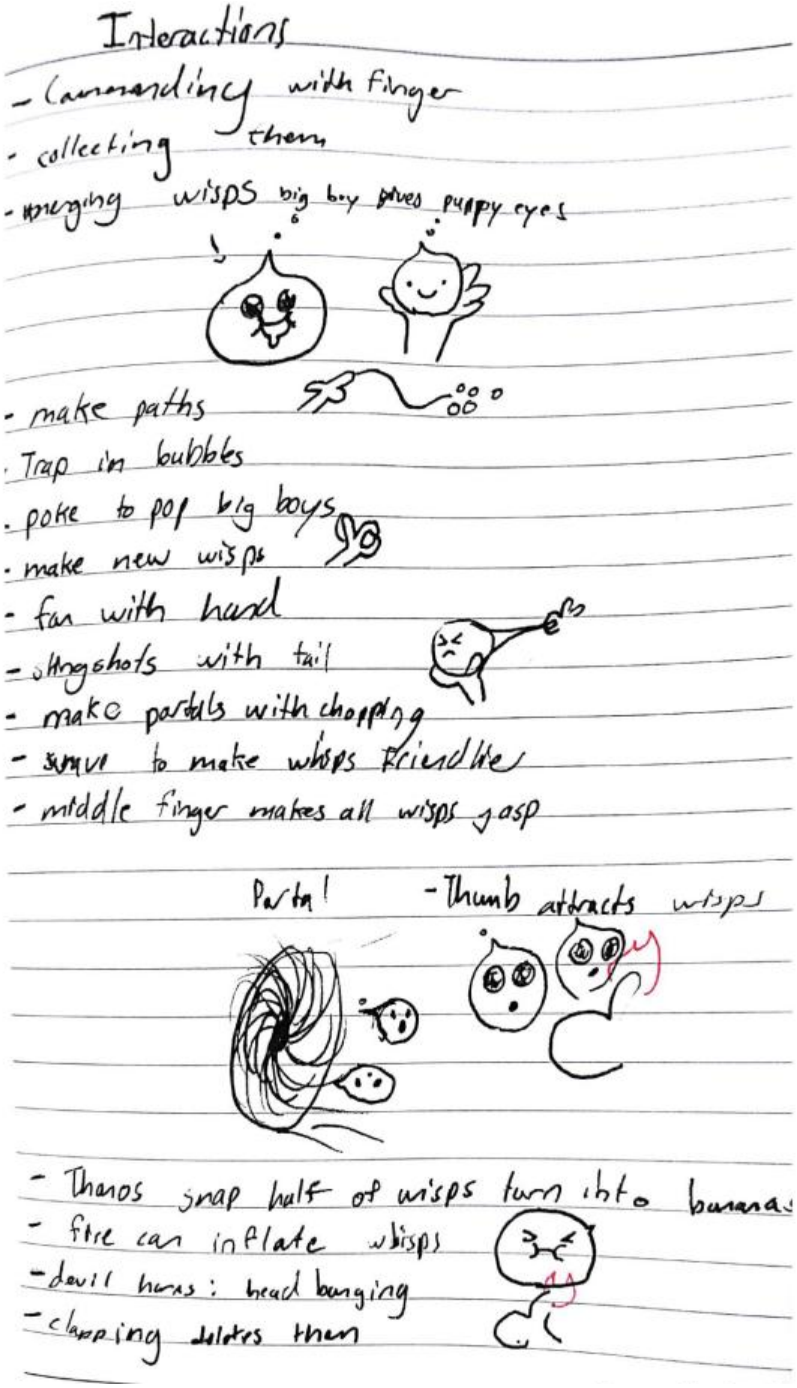
- Guiding needs to be responsive
- What noises do they make?
- Different will-o-wisps?
- Size/shape matter
- How many?
- Tail/particle effect

Interactions

- Simon says
- Elemental
- Collection
- Feeding
- Merging wisps
- Make path
- Trap in bubbles

- Make new wisps
- Fan
- Slingshots
- Smile when waving (friendliness)
- Open portals, wisps get sucked in

Original Notes



Will-o-wisps prototype

- guiding needs to be responsive
- What noises do they make
- different will-o-wisps?
- size / shape matter
- how many
- tail / particle effect

Interactions

Simon Says

elemental

smaller

Interactions

I liked it

- guiding / directing was more fun
- fun on it's own
- do something along with directing

Collection

~~feeding~~

merging wisps

make path

trap in bubbles

make new wisps

fan

~~phoo~~

~~astonishing~~ slingshots

smile when waving

friend / mess

Slime Ranchers

agario

open portals, get sucked in

~~rope wisps~~


BOOYO
PARK

Appendix H: Playtest Reports

These reports were made **after each playtest session to record data** that was collected. It includes the moderator script, metrics, in-game observations, data from surveys, and recommendations.

BOOYO PARK PLAYTEST REPORT

February 8th, 2019

Michael Arcadi, Justin Capcap, James Pratt, Jennifer Stienstra

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Introduction

We will be conducting a playtest of our MR experience *Booyo Park*. We will have the participants play through a build of the game that should take roughly 5 minutes each. One of the biggest features to our game is that it is mixed reality, which enables users to see video game characters within the real world and interact with them as if they were physical beings. While this is great in terms of immersion, we want to refine the usability and accessibility of our interface. One area in particular we want to test is the depth at which the characters occupy and whether or not that character's position is clear to the user. Along with that, we want to gauge how users interact with the characters in the world and see if there are any variants in user behaviour. Lastly, we want to test how quickly players adapt to playing the game with their hands as opposed to controllers.

Objectives

1. How well can users gauge the distance between themselves and the Booyos?
2. How do users respond to using their hand as a primary means of interaction?
3. What does the user's progression look like while playing for a period of time?
    a. Is there any changes of emotion?
    b. Is there any changes in behaviour?
    c. Is there any changes in engagement?

d. On average, when do players try and take the headset off?

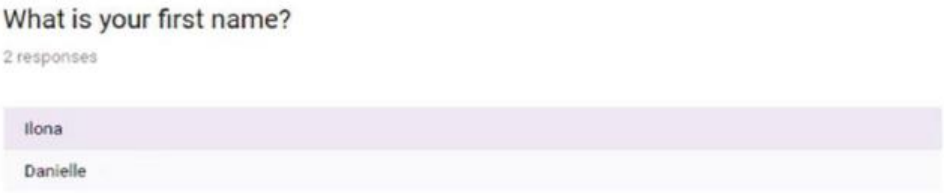
Metrics

- Rate of errors: How often do users fail to grab a Booyo? How often do users confuse the distance between themselves and a Booyo in front of them?
- Completion Rate: Can users grab Booyos? Can they merge them? How efficiently can users' complete tasks without direct instructions?
- Task Time: How long does it take for users to get comfortable using the in-game hands? How long does it take users to find out they can merge Booyos?
- User Satisfaction: On a scale (1 low, 5 high), how engaged were users with the characters? (pre, mid, and post playthrough)

Pre-test Survey

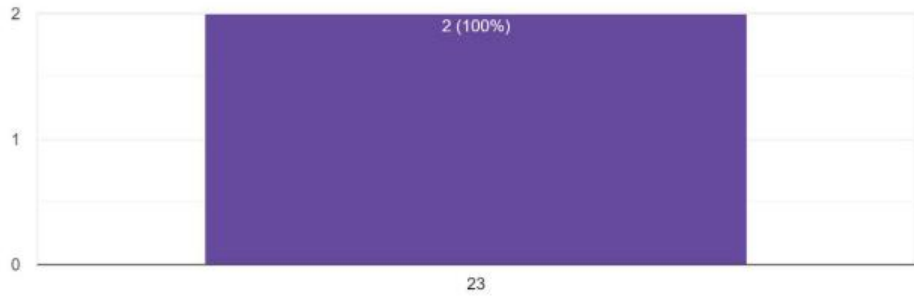
Link to pre-test survey: https://goo.gl/forms/6N0hATFQ5knJDnK73

Results



1. What is your age?

2 responses

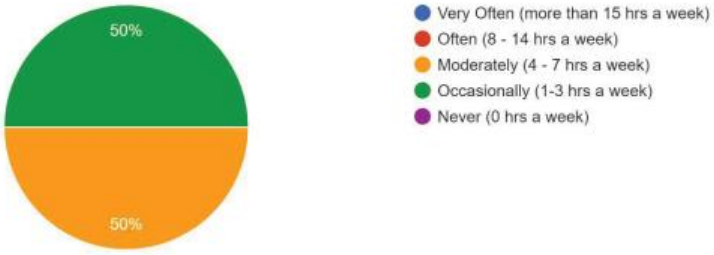


2. What is your gender?

2 responses

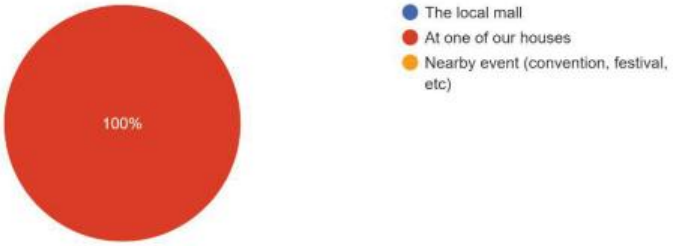
3. How often do you play video games?

2 responses



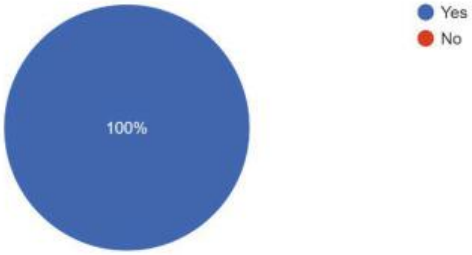
4. When hanging out with friends, where do you usually go?

2 responses



5. Have you play any VR, AR, or MR game before?

2 responses



5a. What are the VR, MR, AR game(s) you have played before?

2 responses

3d painting
Pokemon? The AR game that comes with the Nintendo DS, with the card question mark. Also the VR painting thing.

5b. Have you experienced any sort of motion sickness while playing these kinds of games

2 responses

Moderator Script

Welcoming playtesters

Hello everyone, thank you all for coming in. Please, help yourselves to some Timbits or water . Today, we will be having you guys play a bit of our mixed reality game, Booyo Sitter. In this game, you assume the role of a caretaker to floating blob-like creatures called Booyo's. King Booyo has asked you for your assistance and has bestowed upon you the ability to interact with these creatures.

Test purpose

Now our goal for today is to watch how you interact with the Booyos themselves and give us a better idea on how player/Booyo interactions work. We'll also be observing details specific to mixed reality, such as being able to properly recognize depth and how it feels to control a game using your hands.

Testing instructions

Before we get started with the game, we have a pre-test survey we'll need you to fill out first. It's only a few questions to gather some demographic data and shouldn't take longer than a minute or so. Next, we'll have each of you play the game one at a time for about 5 minutes. Don't worry about "being good" or winning as that's not the point of the test. Just allow yourself to play the game naturally and in the way that feels the most comfortable for you. While you are playing, we'll be asking you some questions about your

experience. After both players have had a chance to play the game, we'll wrap up with a 15 minute debrief session where we'll ask you some questions about the experience as well as hear any suggestions you might have for us.

Explaining how to think aloud

A few things we need from you other than playing the game is to think aloud. Please be very vocal about any thoughts you are currently having, whether they be positive or negative. A good way of approaching this is imagine you're a Let's Player or a Twitch streamer. The more you talk about what's going on, the more clearer of an idea we can get about an aspect of the game. For example, if there is a part of the game that is frustrating or confusing, we'd like you to speak about your thought process on figuring it out.

Prompting questions to ask during the test

1. *How far is that one Booyo from you?*
2. *What are you doing right now?*
3. *How come you are merging all of the Booyos?*
4. *Why are you poking that Booyo?*
5. *How are you feeling right now?*
6. *Why are you focusing on that one Booyo?*
7. *Is there a Booyo in particular you're fond of?*
8. *Why did you make the big Booyo pop?*
9. *Where are the rest of the Booyos?*

10. *How much time do you think has passed?*

Debriefing discussion questions to ask after the test

1. *How does playing with your hands feel compared to traditional controllers?*
2. *How do you feel about the play-length?*
3. *What was your favourite thing to do with the Booyos?*
4. *What was your least favourite thing to do with the Booyos?*
5. *What was your own personal goals while playing the game?*
6. *How did merging Booyos feel?*
7. *How did grabbing Booyos feel?*
8. *Could you have a fairly good idea on how far a Booyo was from you?*
9. *What are your thoughts on the game being in mixed reality (seeing objects float around you in the real world?)*
10. *How was the overall experience of the game?*

Wrap-up

Thank you all so very much for participating in our playtest. We've collected some valuable data and suggestions from this playtest. Before you go, we would like for you to each fill out one of these post-test surveys so we can get a little bit more insight from you. Also, feel free to have any of the Timbits or water here while you wait as a thank you for your time today.

In-Game Observations

Tester 1 (Ilona)

(There were technical issues with this tester's experience that caused the hands to not work all the time)

Behaviours

- Started being comfortable with hands at **1 minute** in
- At one point, one of the Booyos got close to Ilona's face, which made her feel dizzy and disoriented
- Ilona remained in the same spot for a majority of the test
- Ilona really liked grabbing Booyos but struggled to do so
- Most of the time, Ilona would try to poke the Booyos over every other interaction.
- Ilona rarely confused the distance between herself and a Booyo
- At no point did Ilona attempt to merge two Booyos together.
    - She did notice that two of them merged on their own.
- Ilona took off the headset on her own after about 5 minutes in

Comments

- "They don't really respond to me"
- "Is the hand working?"
- "I'm feeling a bit bored and overwhelmed right now"

- “This is a fun concept”
- “Oh they’re really cute!”
- “I like their colour!”
- “I really like moving around and touching them”
- “What am I supposed to do with these guys?”
- “I kind of want to take this thing [headset] off, it’s getting hot”
- “I wish these guys would respond to my hand more”

Tester 2 (Danielle)

Behaviours

- Managed to get comfortable with hands within **25 seconds**
- Figured out how to merge Booyos within **30 seconds.**
- Struggled to grab or properly interact with Booyos
    - Partially due to the hand offset
- Spent most of the playtime trying to grab Booyos
    - Had a goal to merge all of the Booyos into one
- Was mostly stationary the entire playtime
    - Bent down to look at Booyos on the floor
- Danielle took an extra 4 minutes (9 in total) playing the game.

Comments

- “Oooh these are pretty!”

- “I like the skeleton hands”
- “I’m trying to get the Booyos to respond”
- [While looking around for Booyos]: “It feels like they’re always out of sight, like they’re hiding from me.”
- “I want to make them [Booyos] bigger!”
- “I’m not sure if I like the hand offset”

Debrief Session

- Both testers really liked the skeleton hands
- Ilona was initially excited and wanted to touch the Booyos, but because they wouldn’t react to what she was doing she was disappointed and bored.
- Ilona mentioned that things would start glitching and sticking to her face
- Ilona also said the difference between seeing the real world through the headset was weird because there was a natural offset to it (things would appear closer than they actually are).
- Danielle thought that playing with hands were really cool as there wasn’t a learning curve to them and as a player you felt more involved
- Danielle mentioned that the Booyos looked like stress balls and were malleable and wanted to see what she could do with them (squish them in her hands, stretch them, etc).

- Ilona felt overwhelmed when a Booyo stuck to her face and when she touched real objects
- Danielle's game started glitching and would have kept going if the glitching stopped
- Danielle thought it'd be cool to see a giant Booyo
- Ilona enjoyed poking and trying to cup Booyos ("it was real cute")
- Ilona didn't like when Booyos got too close to her face
- Danielle didn't like when Booyos wouldn't interact with her
- Danielle said that merging felt really good whereas Ilona saw that the Booyos could merge but couldn't get it to work for herself
- Danielle could tell where Booyos where spatially around her and how far they were
- Ilona liked how the Booyos moved around
- When asked about how it feels playing in MR (mixed reality):
    - Ilona thought it was cool but was a bit blurry with her glasses. She was also worried about tripping over things
    - Danielle said the backpack felt great ("like a hug"). Setting up the wires at the beginning was a bit freaky. She also said the headset was comfy but kind of warm. She didn't get nauseous and she could find a "sweet spot" by adjusting the headset's tightness

- When asked about the glitches in the game:
    - Danielle saw that the Booyos appeared pale and two of them would be in the same spot a bit offset from each other.
- When asked about the space and how depth was perceived:
    - Ilona mentioned that seeing Booyos that were out of reach (up in the ceiling, clipping with the ground) was annoying
    - Danielle said that bending over to look at low Booyos was cool.
- When asked about the overall experience
    - Danielle said that it was a lot of fun to grab, hold and merge the Booyos and thought it could be fun to just shake them a bit
    - Ilona said that if the game had worked properly, the game would have been fun for sure. She said it'd be cool to squish Booyo's until they popped.
- When asked about the possibility of a colour mixing mechanic:
    - Ilona mentioned that the colours would have to be pastel as she was wondering if you'd get brown/muddy colours after a while of mixing them together.
    - Danielle thought the mechanic could be cool but much like Ilona mentioned that the mixing would have to not be traditional as to not get

muddy colours. She said that the Booyos were “Airy, cute, small and round and colour would definitely play into that.”

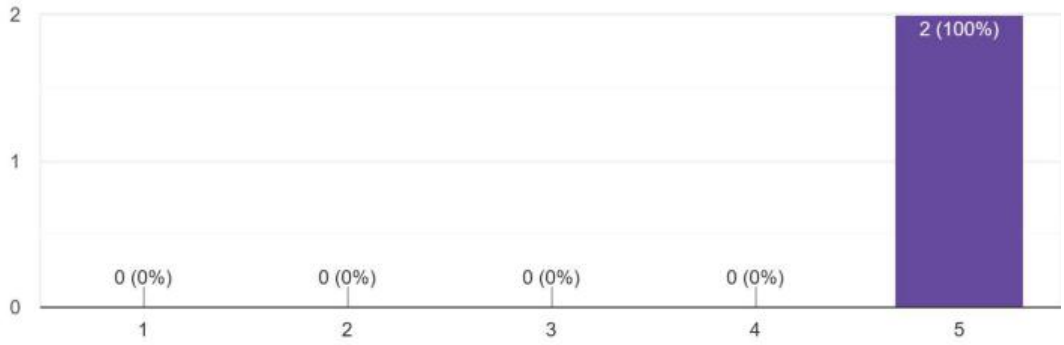
Post-Test Survey

Link to survey: https://goo.gl/forms/XYqseuYBxIPV732K2

Results

1. How did you feel about using your hands as a way to interact with the game?

2 responses



Explain your answer

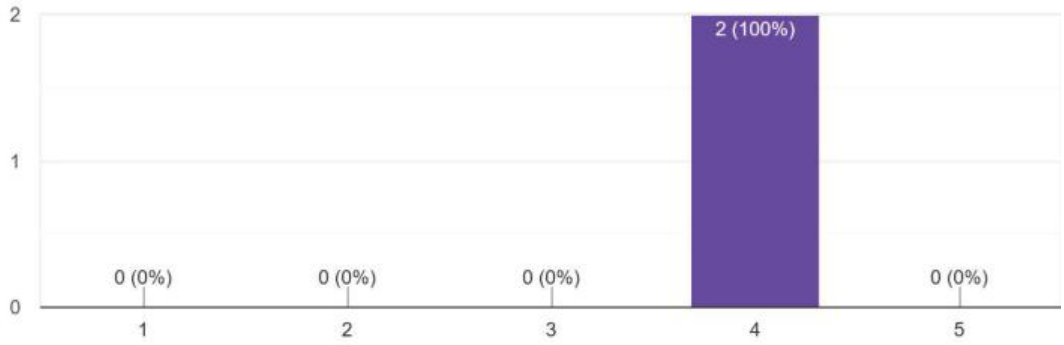
2 responses

I liked the idea of being able to squish or poke the booya's and I think its more interactive than if it the controller was something else

When you use your hands your feel more connected to the game and the booyos.

2. What were your thoughts on the size, position, and colour of the in-game hands?

2 responses



Explain your answer

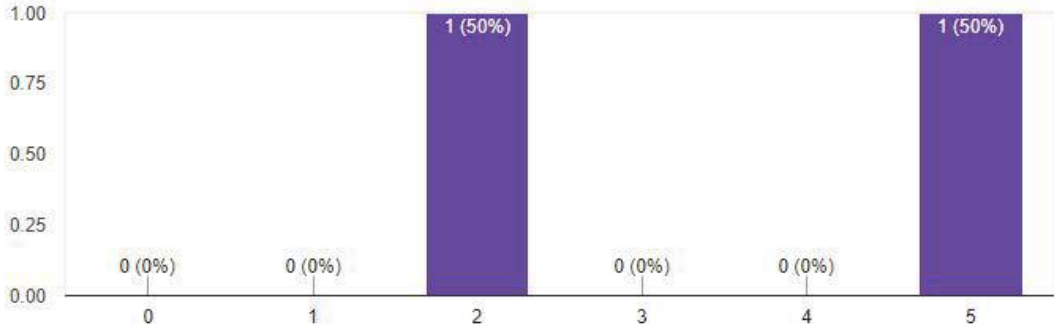
2 responses

I would want the skeleton hands to match in color, and I like the white and color tones

It would be nice to see more light soft color. enjoy making them bigger.

3. How often did you find it hard to know where a Booyo was spatially (i.e. How far away you were from it).

2 responses



Explain your answer

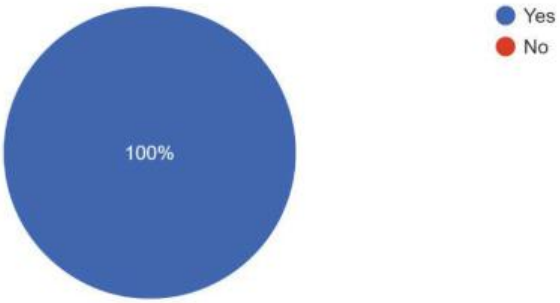
2 responses

I didn't really have a problem with spotting the difference, it was just hard to get too them sometimes because they were too far away

The only time they were hard to find was when it was not working right.

Did you feel like you had enough time to do what you wanted before the session ended?

2 responses



Explain your answer.

2 responses

The booya's weren't interacting with me too much so I lost interest

There is just enough time to play with them and make a really big Booyo

Recommendations

In regards to depth issues, the tests we ran seem to conclude that players don't have much issue determining where Booyos are placed spatially around them. However, the more apparent issue is with where they are in general. Ilona mentioned that seeing Booyos in places she couldn't get to (the ceiling, in the floor, outside the play area, etc) is annoying. Danielle also mentioned there were a few times where Booyos were in places she could not get to. Another detail to take into consideration is that both testers did not move much at all during their playtest. The team could try placing Booyo's in a set space (a "playspace") and have the player roam around that as opposed

to just spawning Booyos directly around the player. This would encourage players to move around the play space to grab Booyos that aren't within arm's reach, but balancing that while making sure Booyos aren't in places the player can't get to might prove to be difficult. During Ilona's playthrough, there was an issue where a Booyo was stuck to her face and it caused her to feel dizzy and disoriented. We believe this was a one-time technical issue, but further investigation might be a good idea to see if this is a reoccurring bug.

In terms of player interactions, we found mixed responses from both of our testers. Danielle managed to figure out how to merge Booyos within the first minute of gameplay where Ilona never managed to merge Booyos by herself. This might have to do with the build not playing correctly, but it might be worthwhile to reinforce that this is something players can do either through an in-game sequence or an onboarding video. Another common response from both testers is the wish for more interactions with the player and Booyo. A possible route is to implement Booyo reactions as soon as possible so that they feel alive and responsive to the player. We are also working on implementing a colour mixing mechanic that we presented to the testers, who both thought the mechanic could work. Once both of these features are in a testable state, it would be a good idea to run a playtest shortly after to gauge how effective these features are

Lastly, the play length of each tester was intentionally varied as we mentioned they were going to play for 5 minutes but we did not enforce when they should take off the headset and backpack. What we found is that players who are not enjoying the experience will attempt to take off the equipment on their own as opposed to players who are enjoying the experience will not voluntarily take off the equipment until prompted to. The idea of including an in-game time limit for players might be good to consider, that way players will know how long they have in the game and when they should start wrapping up to prevent players from leaving too early or from playing too long. One way to incorporate this would to have the in-game hands have batteries that wear off after 5 minutes. There are a couple of ways to help control play time which we will have to explore and test at a later date.

Conclusion

Despite some technical issues with the build, the test provided the team with invaluable data. The biggest issue with the game at the moment seems to be the Booyos themselves and how they interact with the players. The team will need to sit down and figure out how to improve interactivity between these creatures and the players. The test proved that players don't have much problems playing the game with their hands as opposed to controllers and in fact find it to be one of the more interesting aspects of the game. The potential issue of depth problems was disproven by these tests, but in its

place, the team has found that having Booyo's spawn in places players can't get to tends to cause frustrations for the player. Coupling that with the detail that neither tester moved much at all throughout their playthrough, it might be a good idea to consider the actual area the player will be playing in. Lastly, the team will need to figure out how to end the game, as players will either stay in the game too long or leave if they aren't enjoying the experience. The team will be using the data collected from this playtest to influence our design decisions and help shape the game to be more catered to our target demographic.

BOOYO PARK PLAYTEST REPORT

February 14th, 2019

Michael Arcadi, Justin Capcap, Keana Almario, Yani Wang, James Pratt, Jennifer Stienstra

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Introduction

We had a large group of high schoolers come into the studio and try out our game. The group was split into two groups who would alternate between playing our games or participating in a panel ran by some of the other designers in the studio. This was a perfect opportunity to test our game with what is essentially our target demographic. We will be conducting a playtest of our MR experience *Booyo Park*. We will have the participants play through a build of the game that should take roughly 5 minutes each. Since we are working in mixed reality and the user interface is essentially their own hands, We want to refine the usability and accessibility of our interface as it is dependent on whether or not. One area in particular we want to test is the depth at which the characters occupy and whether or not that character's position is clear to the user. Along with that, we want to gauge how users interact with the characters in the world and see if there is any variants in user behaviour. We also want to see how they engage with other people and their friends around them. Lastly, we want to test how quickly players adapt to playing the game with their hands as opposed to controllers.

Objectives

1. How well can users gauge the distance between themselves and the Booyos?
2. How do users respond to using their hand as a primary means of interaction?
3. How do users interact with their peers in the real world while in game?
    a. Do they talk to them?
    b. What is their reaction?

4. What does the user's progression look like while playing for a period of time?
    a. Is there any changes of emotion?
    b. Is there any changes in behaviour?
    c. Is there any changes in engagement?
    d. On average, when do players try and take the headset off?

Metrics

- Rate of errors: How often do users fail to grab a Booyo? How often do users confuse the distance between themselves and a Booyo in front of them?
- Frequency of communicating: How often do they interact with other people while in-game? What do they talk about?
- Completion Rate: Can users grab Booyos? Can they merge them? How efficiently can users complete tasks without direct instructions?
- Task Time: How long does it take for users to get comfortable using the in-game hands? How long does it users to find out they can merge Booyos?
- User Satisfaction: On a scale (1 low, 5 high), how engaged were users with the characters? (pre, mid, and post playthrough)

In-Game Observations

1st Group

1. 20-30 year old man
    a. *“This is my first experience with VR”*
    b. Played less than **1 minute**
    c. “This is so cool!”
    d. Moved hands a lot
2. 2. Group of 2 boys, younger
    a. They were scared to wear the backpack and were telling each other to put it on
    b. They were playing in an insolated space so they couldn’t really interact with each other
    c. Mentioned that they *“Felt like [I’m] underwater”*
    d. The other boy who wasn’t playing was bored since he was isolated as the area was blocked off like traditional VR. We tried to engage with him, but he clearly was bored waiting
    e. Tech issue caused a long wait between switching between the two boys, so they ended up leaving
3. Teen boy
    a. Less nervous about onboarding then the group of two boys
    b. *“How do you grab them?”*

c. He was too far away to grab the Booyos

d. "I don't know if its glitching or not"

e. "Kidnapped" bug happened again

f. He properly explained it, and could tell you exactly what was happening

g. Booyos kept turning away, bug.

2nd Group

1. Teen boy
    a. Moving around area
    b. *"I'm not sure if this [hand] offest works."*
    c. Dizzy
2. Teen boy
    a. Moved around the area using two hands to grab Booyos
    b. Seemed to be smiling and having fun
    c. Said his goal was to grab all the Booyos
    d. He didn't attempt to merge any Booyos
    e. *"The whole experience felt surreal"*
    f. *"The hand calibration felt a bit off"* referring to hand offset
    g. *"Overall was a great experience"*
3. Teen boy with glasses
    a. Said the game was blurry
    b. "It's really weird" he said this several times during his playthrough
    c. Merging was hard to tell what was happening

    d. Liked to make the Booyos bigger

4. Teen Boy
    a. Started with playing with his hands
    b. "*This is really different"*
    c. "*Felt like nothing was there"* in terms of grabbing Booyos
5. Teen Boy
    a. Spent time just looking at hands
    b. Was very hesitant to move
    c. "They're really low to the ground, I can't get them."

Recommendations

Based on what we found, there seems to be some friction on the onboarding process with groups. From what we found the process can not only be intimidating for teen boys, but while waiting to play next there isn't much for the queue to do other than talk with us. We are planning on incorporating some sort of onboarding video similar to those found at The Void or The Guardian at Wonderland in order to entertain queue lines while they wait to play

A consistent issue we found was that playing the game with a hand offset, where the in-game hands do not match the users' real hands, is not preferable. Nearly all our playtesters said that the hand offset felt "off" or "didn't really work." We should consider doubling down on making sure that the hands don't offset, as trying to design around the issue has not yet yielded any results yet.

Lastly, another common issue we found not just in this playtest but the other playtest was that players who wear glasses and then take them off tend to see the game fairly blurry. This is a common problem with VR in general as the lens in the headset do not make a good substitute for prescription glasses. While we could enforce players to wear glasses during play, we might run into issues where players won't feel comfortable playing the game with them on. We should try to go for a more passive approach and recommend that players with glasses leave them and simply state that the game might appear blurry if they are left on.

Conclusion

Despite some rocky technical issues, we managed to get quite a bit of data from our intended demographic. Overall, more attention to the onboarding/offboarding process is needed as of now users are either hesitant to put on the equipment or bored waiting for their turn to put it on. We also need to address the issue of having a hand offset as we are finding that users consistently do not like having in-game hands not aligning with their real hands. However, we are noticing that players seem to be content with the amount of content in the game so from what we can tell in this stage, it's mostly optimization and polish.

BOOYO PARK PLAYTEST REPORT

March 12, 2019

Michael Arcadi, Keana Almario, Justin Capcap, Jennifer Stienstra

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Introduction

We will be hosting a small group of high school students to the playtesting lab to playtest our latest build of Booyo Park. The group is made up of teens, one of whom is the sister of one of the team members. While we've done playtests with high school students prior to this test, they had always been in larger crowds. Having only a few students will give us the opportunity to gather data in a more calm setting. For this playtest we're looking to gain better insight with how users interact with their peers while in the experience and what they say. We're also going to be looking at their progression while playing for a period of time and observe any changes in behavior, emotion, and engagement. Our team will also be looking to see how they interact with the Booyos and what actions they perform with them. We'll also see how they react to the onboarding and offboarding process so we can have a better idea of what needs to be improved. Another thing we'll be looking at how the users react to the visuals and audio of the experience. Lastly we'll be gauging their reaction to being untethered vs tethered to a computer.

Objectives

1. How do users interact with their peers in the real world while in game?
    a. Do they talk to them?
    b. What is their reaction?
2. What does the user progression look like while playing for a period of time?

   a. Is there any changes of emotion?
   b. Is there any changes in behavior
   c. Is there any changes in engagement?
3. How do the users interact with the Booyos?
   a. Merge?
   b. Make them pop?
   c. Throw them?
   d. Hold them?
   e. Grabbing them?
4. How do the players react to the onboarding/offboarding?
   a. Do they seem confused by any instructions?
5. How do they feel about the movement and animations of the booyos?
6. How do they feel about the audio?

Metrics

- Onboarding/Offboarding Time: How long does it take for the user to put on all the gear and begin the experience and how long does it take it off afterwards
- Frequency of communicating: How often do they interact with other people while in-game? What are they talking about?
- Completion Rate: Can users grab, merge and throw the booyos? How often do they do those actions? How efficiently can they do this without direct instructions?

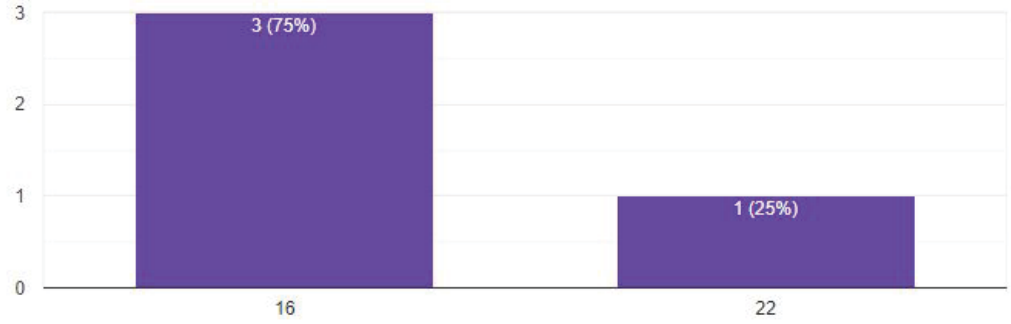
- Task Time: How long does it take for users to understand what they can do with the Booyos
- User Satisfaction: One a scale (1 low, 5 high), how engaged were users with the characters? (pre, mid, and post playthrough), as well as their reactions to the animations and audio in the experience.

Pre-test Survey

https://drive.google.com/open?id=1-mX7iWiMBea3VwzwU5eZduTZ7L2IKew9_QRcjEuxq0Y

2. What is your age?

4 responses

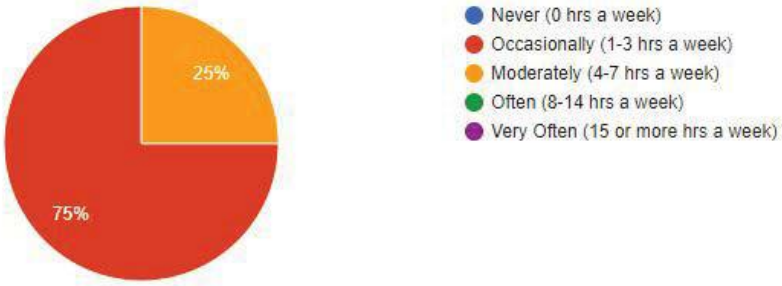


3. What is your gender?

4 responses

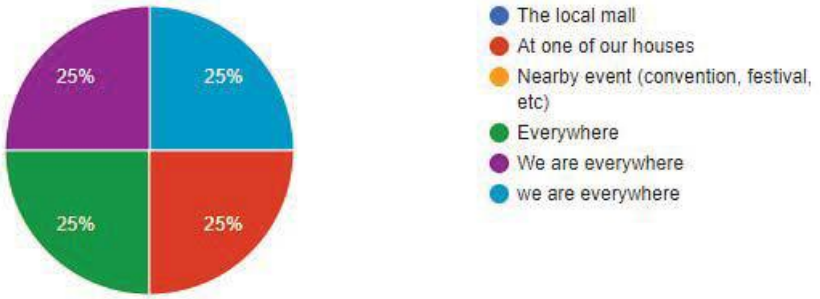
4. How often do you play video games? (This includes mobile and facebook games)

4 responses



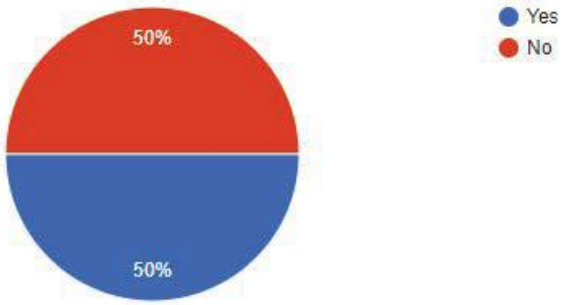
5. When hanging out with friends, where do you usually go?

4 responses



6. Have you played any VR, AR, or MR games before?

4 responses



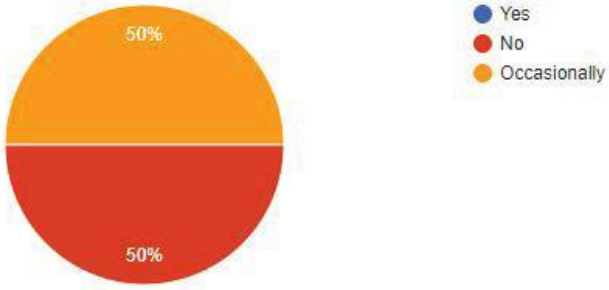
6a. If yes to 6, what are the VR/AR/MR game(s) you've played before?

2 responses

Skyrim
There was a roller coaster game with shooting spiders. I do not remember it's name.

6b. If yes to 6, have you experienced any sort of motion sickness while playing these kinds of games?

4 responses



Moderator Script

Welcoming playtesters

Hello everyone, thank you all for coming in. Please help yourselves to some Timbits or water. Today we'll be having you play our mixed reality experience, Booyo Park. In this experience, you will now be able to see invisible creatures called Booyos, and be able to play and interact with them.

Test purpose

Our goal for today is to see how you play with the Booyos themselves in order to observe how the interactions the user and the Booyos work. We will also be observing how and if users interact with others around them while in the experience, as well how you feel about the onboarding and offboarding process. Other data we'll be collecting is how users react to the visuals and audio of the experience. Lastly we'll be observing your progression for the duration of the playtest, like how you behave and what your emotions are over time.

Testing instructions

Before we get you started, we have a pre-test survey we'll have you fill out first. This will only take a few minutes at most and will help us gather some important demographic data. Afterwards, we'll have you try out Booyo Park one by one. Please don't worry about "being good" at the experience. We're not here judging you. Just let yourself to go through the experience and do whatever feels natural and comfortable to you. While you're playing we will be asking some questions about your experience. After everyone has had a chance to

try out the experience, we'll wrap up with a debriefing session where we'll ask you some questions and listen to any suggestions you have, and then have you do a post-test survey.

Explaining how to think aloud

One thing that will help with collecting data is thinking out loud while playing the experience. We ask that you please be vocal with any thoughts you have as you think them, whether they're positive or negative. Pretend that you're a twitch streamer or a youtuber if that helps you understand. Thinking out loud will help us better grasp your progression through the experience, and can help identify areas that need work on.

Prompting questions to ask during the test

1. *What are you doing right now?*
2. *How did you know to merge the Booyos?*
3. *Why are you throwing the Booyos?*
4. *Why did you talk to your friend just now?*
5. *How are you feeling right now?*
6. *How did you feel when the Booyos popped?*
7. *Why are you holding that Booyo?*
8. *Why are you poking the Booyo?*
9. *Why do you keep merging the Booyos?*
10. *How does it feel to throw the Booyos?*
11. *How does it feel to use the headset on a desktop computer*
12. *How does it feel to use the headset with a backpack computer*

Debriefing discussion questions to ask after the test

1. *How did you feel about getting the equipment put on you?*
2. *How did you feel when the equipment was being taken off?*
3. *What do you think could be improved on in the onboarding/offboarding process?*
4. *What was your favourite thing to do with the Booyos?*
5. *What was your least favourite thing to do with the Booyos?*
6. *How did it feel to interact with the Booyos?*
7. *How did it feel to interact with other people while still in the experience?*
8. *How do you feel about the Booyos?*
9. *What are your thoughts about being in Mixed Reality?*
10. *What were your thoughts about being tethered to a desktop vs being untethered?*
11. *How was your overall experience with Booyo Park?*

Wrap-up

Thank you so much for attending our playtest session. Thanks to you, we've been able to gather important data that will help us make this experience better. Before you leave, we have a post-test survey that we'd like for you to fill out so we can just get a little more insight from you. Feel free to help yourselves to remaining timbits as a thank you for taking the time to help us.

In-Game Observations

Meghan

-pushed. "Oh?"

-tries to squish/clapping them

-wonders why her finger tips are blue -> not gloves?

-diamond on gloves is like the sims

-when blobs pop = "they break?" "when I touch them they break?" "why is it getting bigger then exploding?"

-gets spooked when they explode

-seems frustrated when they try to hold it because they fly away

-didn't know you could grab/hold them = "i GOT IT!" victorious, super loud, drawing lines with booyo while holding it

-tries to put it on her friends and in donut box

-"this reminds me of kirby"

-"you guys have the glitvh filter from snapchat on you"

-music: "it's aite"

-uses restart to keep them back in place

Jackie

-trying to eat blobs "because they're so cute"

-likes it when they come back

-"when I get closer they go higher"

-"throwing the blob isn't going the distance I want them to"

-tries to hit them "like balloons"

-tries to give them to her friends, tried to play catch w/ it

-complained that they kept floating away/ breaking or popping

-tries to flick

-tries to blow them

-tried to get them bigger because they're "huggable", tries to split them like putty "how do you split them?"

-discouraged after it doesn't work

-tried stomping on them and see if it worked

-tickle the balls

-holding two at once = "I don't have the skills for that"

-likes manipulating them

-tries to put them in the box, told them to stay = frustrated that they wouldn't

Meagan

-Feels cool "that they're there"

-waht do you think of them? "weird"

-shocked they got big, doesn't know how, didn't expect it

-discovers it can be done intentionally

-finds the ball things (tail) weird

-sad when it explodes because she's trying to make it big

-scared when she sees it explode

-tries to make it "a different shape" after seeing one that's oval

-grabs with both hands

-confused: "I don't know how I'm doing this stuff but it's happening

-tries to put them all together

Michelle

-really scared "they just...APPEAR"

-"it just went" -> popping

-"they explode because they're bigger"

-likes putting them together, really likes the loop of grab, merge, pop

-tries to put them in box -> "I wanna keep them"

-hard time hearing Jen

-"They're still scary", then tries to kick them away

-shocked when they stare at her

-"my hands look cool in this; like I got my nails done"

-feels like the booyos need to "have something else"

-collecting them

Other

-Play sessions went on for a long time, first 1-2 minutes was spent adjusting to being in Mixed Reality and seeing what they can do within the game. Afterwards they spent time really engaging with the creatures and the experience.

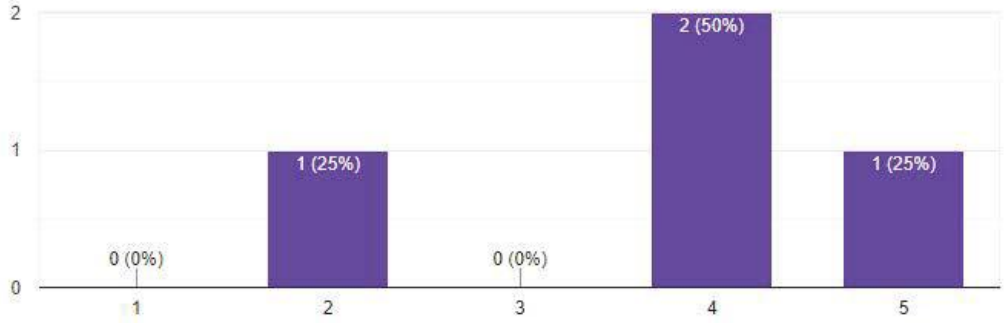
-Each play session lasted for about 10 minutes and only ended when we ended it

Post-Test Survey

https://docs.google.com/forms/d/12IEAe6YYL-ZcEkvOKazNH7DPvAsffuUc8HoYlbQuYEM/edit?usp=sharing

2. How did the onboarding feel?

4 responses



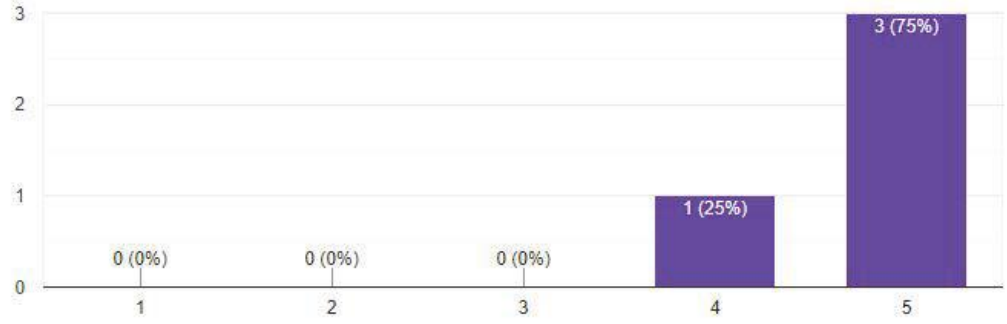
2a. Explain

4 responses

Slightly disorienting, plus wanted back pack strap to not fall off.
I felt as if it was a bit disorientated when I first put it on but once onboarding was done it was fine.
it was quick and easy
I was nervous

3. How did the offboarding feel?

4 responses



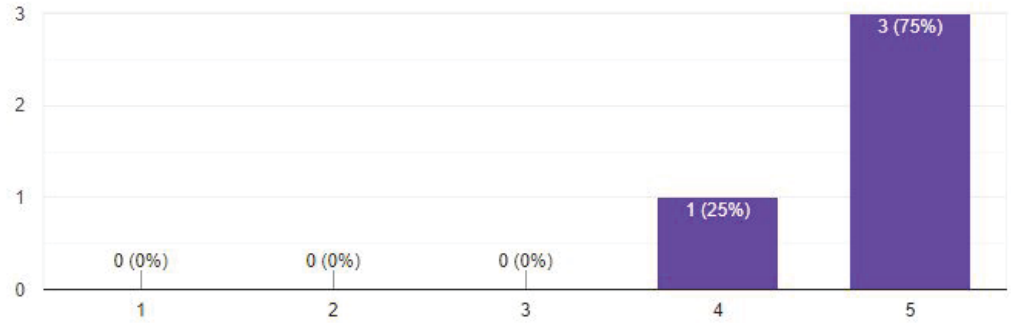
3a. Explain

4 responses

Super easy transition from gaming world to real world.
It was not disorientating and overall an easy transition
A little scary because I was unaware of Justin beside me taking it off
it was less confusing then on boarding

4. How do you feel about the Booyos?

4 responses



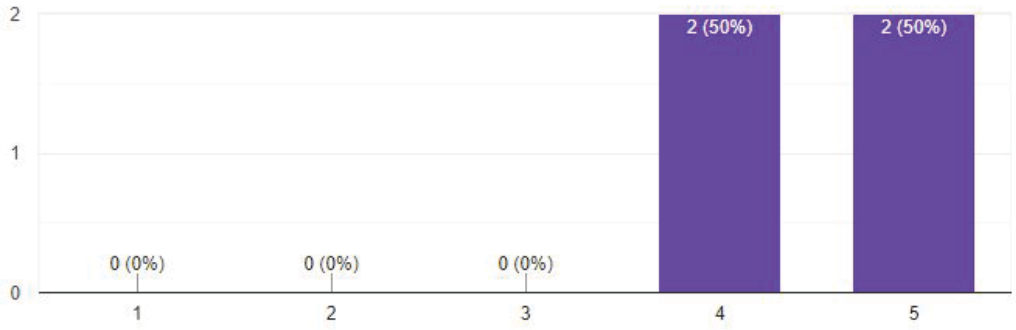
4a. Explain

4 responses

They are so cute! sounded cute and I loved them.
I liked them but I wish they had more colors. They were fun to play with and liked their shapes.
They so cute and I want one.
they were cute and bouncy

5. How do you feel about the interactions with the Booyos?

4 responses



5a. Explain

4 responses

It was fun playing with them and manipulating them.
I liked it because they were like bubbles I could control and they were bouncy.
They moved smoothly and flowed, they reacted to your touch most of the time, sometimes they would not follow what I was tryna do
it was cool, there were lots of things to try dong to them.

6. What was your favourite thing to do with the Booyos?

4 responses

Bring them together to make it bigger then making them explode.
I liked collecting them and putting them together
Make them bigger
I liked dragging them around and hitting them

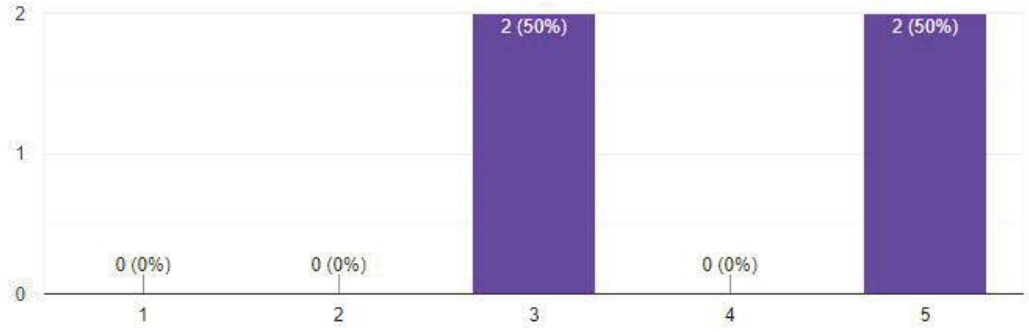
6a. Explain

4 responses

I liked making it bigger and seeing how many I could put together with out it exploding.
They got bigger and exploded
It was fun seeing them get bigger in front of my eyes
I liked seeing the tails following them and seeing them float across the room.

7. How did you feel about being able to interact with other people while in the experience?

4 responses



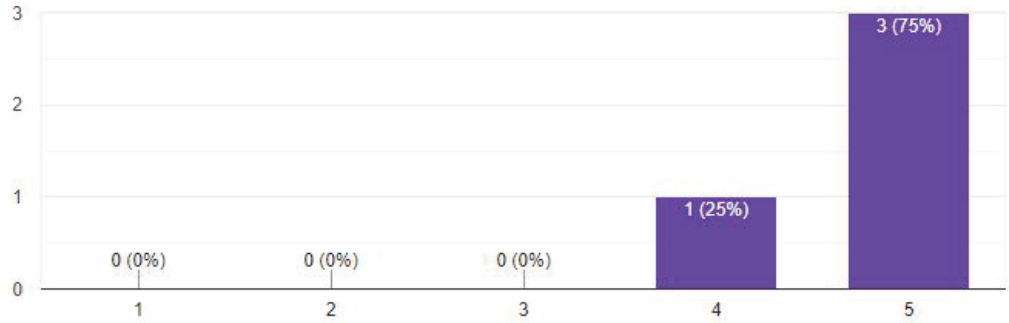
7a. Explain

4 responses

I liked that I could see them and talk to them. Not hitting other items, using items in the room to set them down.
I forgot to try this
You still felt like you were irl but the creatures became your reality
i forgot to interact with other people but I liked being able to see people though.

8. How did you feel about the music and sound effects?

4 responses



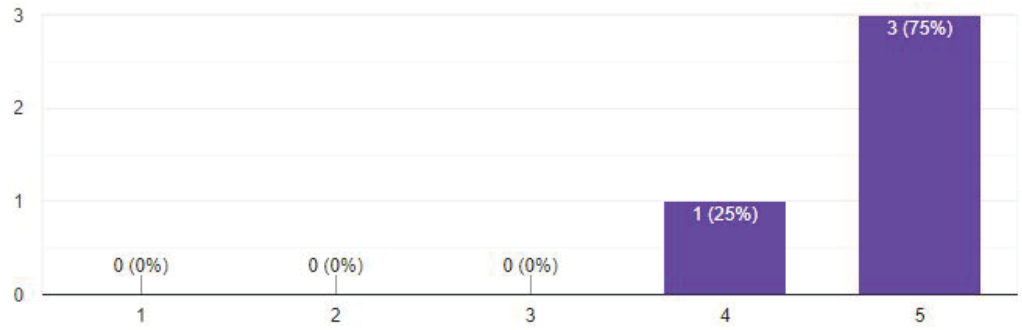
8a. Explain

4 responses

It was really cute and relaxing the music. It set the tone for the game really nicely.
It matched what was happening
It matched the mellow/ zen mood
They were cute and matched the animations

9. How did you feel about the animations?

4 responses



9a. Explain

4 responses

Adorable.
They were cute
The creatures were cute anda nice shade of blue, they were a nice quality like HD instead of grainy texture like 540
I liked watching them float around me and move when i touched them.

Recommendations

One of the first changes we need to consider is making sure the user is made aware of the presence of any members of the team who is trying to help with offboarding. During one of the tests, the user was spooked because they were not aware of the team

member being around them. Whoever is responsible for offboarding needs to ensure that they are making themselves clear to the user.

Another change we'd recommend is increasing the amount of play time. Originally we had set out to limit the play time within the MR experience to around 2 minutes. However, we saw through observations as well as comments from the testers that 2 minutes is not enough for the experience. Moving forward, we suggest extending the length of the experience to 5-10 minutes.

Lastly we recommend talking to the user more during the onboarding process, and making sure they are completely comfortable and know what to expect when they put on the backpack and the headset. Our playtesters were generally unsure about the backpack, with one being nervous, and it might help to ease their minds if we let them know what to expect, like how their vision might be initially blurry.

BOOYO PARK PLAYTEST REPORT

Oakville Library Showcase

March 30, 2019

Michael Arcadi, Keana Almario, Justin Capcap, James Pratt,

Jennifer Stienstra, Yani Wang

Table of Contents

Introduction

We will be showcasing Booyo Park to the public for the first time. As a result, there are some things we'd like to test and improve on before the showcase at Level Up in three weeks. We will be making observations throughout the showcase in order to inform us on what areas to improve upon.

One objective we're looking to test is how the users interact with their peers in the real world while in game. This is the perfect setting to test this since there will be around 2000 people at this event. Another thing we're going to be observing is how they react to the onboarding and offboarding process and see if there's anything that's confusing them. In parallel with the onboarding process, we will also be observing the reactions to the intro video that will be playing for audiences. It's not mandatory to watch, but we want to know if people are watching it and what they think of it. Lastly, we will also be observing the audience's reaction to the user in the headset and how/if they interact with them.

Objectives

1. How do users interact with their peers in the real world while in game?
    a. Do they talk to them?
    b. What is their reaction?
2. How do the players react to the onboarding/offboarding?
    a. Do they seem confused by any instructions?

3. How does the audience react to the user in the headset?
4. How does the audience react to the video that is played while they wait?
    a. Do they watch it?

Metrics

- Onboarding/Offboarding Time: How long does it take for the user to put on all the gear and begin the experience and how long does it take it off afterwards
- Frequency of communicating:
    - User: How often do they interact with other people while in-game? What are they talking about?
    - Audience: How often do they interact with the user in game? How do they interact with the user?
- Number of viewers: How many people watch the intro video? Do they watch it completely or do they stop halfway through?
- Emotion from video: What expressions are on their face when they watch the video?

In-Game Observations

Several dozen people played Booyo Park at the Oakville Public Library. Play time was on average about 2 minutes. The reason for this was because there always plenty of

people waiting in line to try out Booyo Park. If there was no line, we allowed the user to continuing playing for as long as they liked.

At least 36 people watched the onboarding video while waiting in line, although it was noted that most of the audience's attention was focused on the monitor that had the mirror display of what the current user could see, as well as the user themselves. All of them seem interested and excited to try out the project, or see what it was, especially the younger kids.

The audience interacted with the user more than the other way around. The audience would often take pictures, talk to the user, and wave to them. The user in turn would typically just focus on the experience, however some of them (at least 20) did interact with the audience by "giving" people in the audience the Booyos, which could be seen in the mirror display. It's important to keep in mind that because the play time was so short, there was much time or opportunity to both play with the Booyos and involve the audience in their experience. In a previous playtest, interacting with other people typically happened later in their session.

Lastly, onboarding and offboarding went smoothly, however sometimes players were unsure as to what the number that appear when they popped meant so that had to be explained by a member of the team.

Recommendations

One recommendation is a change to the onboarding video that plays on loop while people wait that clearly outlines what the popping number represents. While it appears in the video, it's apparent that the users don't pick up on the meaning. Having the monitors away from each other might better ensure that the onboarding video is watched and that the audience isn't completely distracted by the mirror display video. The following recommendations are ones that would make the overall showcase experience better. One would be for the next showcase, which will be level up, is to create a clear queue. While the team did a great job engaging with people who were waiting to try out Booyo Park, the line to try it was disjointed. Another recommendation is to have microfibre wipes to wipe off any excess cleaning product left behind by the lysol wipes as it left the headset pretty wet.

Appendix I: Meeting Notes

These are notes from **various meetings** we had over the course of the project. We used these notes to **remember the decisions we made and the reasons behind them** for each meeting, as well as images of the original notes we took.

Game Idea Restrictions (?)

Date: September 6, 2018

[Context: These were restrictions we had placed on ourselves in September, before production began and before we had begun to experiment with the HP backpack and headset. In the end, several of these restrictions were scrapped as the idea evolved and we learned more about the capabilities of the tech.]

- Some narrative thing (can be non-fiction, world building/ env. Storytelling)
- No/minimal character modelling
- Not super realistic assets
- If possible, level progression (something for the player to go through)
- Preference objective-based gameplay
- Not guns/warfare
- Space may be limited (player will move freely within a space)

- KEEP IN MIND: we don't know how the controls work yet! (HP headset?)

Team Goals

- Actual sprints!!

Meeting 2018-09-13

[Context: In this meeting we came together as a team and pitched several ideas. Afterwards we selected potential mechanics that some ideas had in common. These mechanics would later be prototyped. Note one of the statements we wrote down was figuring out how we would do hand recognition. This was before we began using Leap Motion.]

Concerns:

- Portability

Agenda

- Present ideas
- Pick top 3
- Decide on team name?

- Things we need to test in the future
    - Hand recognition

Cat Stacking

- Arcade
- Stack to reach highest level
- Different size cats
- Multiplayer?
    - Sabotage?

Santa's lil workshop

- Conveyor belts everywhere
- List of gifts
- Glue, wrap, tie, etc
- Hot potato
    - Catch them or they break

Thought bubbles on people

- People/facial recognition
- Different expression = different thoughts
- Maybe different emotions you can use for different ideas?

Catch the lil boys

- Object/surface recognition
- Cute characters running around
- Build paths/bridges for them with real physical objects

Drawing with hands

- Draw symbol
    - Cast spells?

Escape Room(s) VR/AR

- 2 rooms you walk between
- As you solve puzzles the room changes
- Funhouse probably

Puzzle Cube (AR)

- Box you can turn over, puzzles on the side
- Going to different places changes the puzzle

History/Learning

- Somewhere in the world
- Tough island -> info pop up

Cooking (Catatouille)

- Cat teaching you how to cook
- Ingredients around space; maybe on floor, go an pick it up
- Further levels -> harder recipes

Catching sealife

- Oil spill, catch fish to save them

Falconeer (Full VR?)

- You're on a platform
- Have falcon solve puzzles around you
- Solve puzzle -> move platform
- Can pet falcon

Life size Rube Goldberg (AR/MR)

- Cranks/levers everywhere
- Ball rolling -> pull cranks (walk over, etc)
- Further levels
    - New machines

Cooking Murder

- Get orders
- Kill customers???

Little Alchemist

- Making potions
- Different kinds of potions
- Maybe a stick you hold = wand and a book w/ recipes

Retired boxer in moving company

- Punch to move things
- Change punch strength based on material (e.g. glass)
- Different kinds of punches (e.g. uppercut)
    - Getting into it?

Commonalities:

- Job sim
- Hand/Object recognition

Mechanics? Tech Considerations?

- Drawing
    - Hand
    - Object (wand?)
- Job sim (cooking/assembly
- Moving physical objects
- Moving virtual objects
- Size of play space
- AI companion that moves in your stead
- Asynchronous multiplayer

Original Notes:

- Drawing w/ hands
- Workshop / cooking

- Physical Stuff
- Job Sim
- Hand / Object recognition

MECHANICS?
TECH CONSIDERATIONS?

- drawing < hand / object (wand?)
- job sim (cooking/assembly)
- moving physical objects
- moving virtual objects
- size of play space
- AI companion that moves in your stead
- asynchronous multiplayer

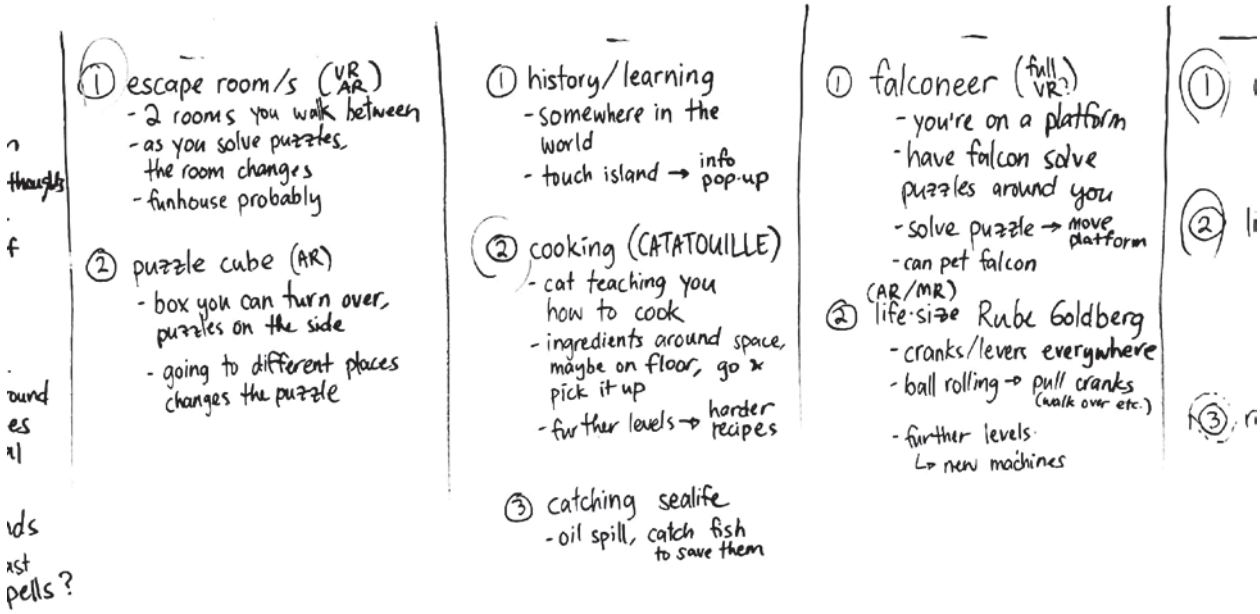
① Cat Stacking
- arcade
- stack to reach highest level
- diff. size cats
- multiplayer?
  - sabotage?

② Santa's lil workshop
- everywhere conveyer belt
- list of gifts
- glue, wrap, tie, etc
- hot potato
  - catch em pls. or they break

① thought bubbles on people
- ppl / facial recognition
- diff. expression → diff. thoughts
- maybe diff. emotions you can use for diff ideas?

② catch the lil boys
- object/surface recog.
- cute charas running around
- build paths / bridges for them with real physical objects

③ drawing with hands
- draw symbol → cast spells?


① escape room/s (VR AR)
- 2 rooms you walk between
- as you solve puzzles, the room changes
- funhouse probably
② puzzle cube (AR)
- box you can turn over, puzzles on the side
- going to different places changes the puzzle
① history/learning
- somewhere in the world
- touch island → info pop-up
② cooking (CATATOUILLE)
- cat teaching you how to cook
- ingredients around space, maybe on floor, go + pick it up
- further levels → harder recipes
③ catching sealife
- oil spill, catch fish to save them
① falconeer (full VR?)
- you're on a platform
- have falcon solve puzzles around you
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- can pet falcon
② (AR/MR) life-size Rube Goldberg
- cranks/levers everywhere
- ball rolling → pull cranks (walk over etc.)
- further levels
↳ new machines

Concerns:
- portability
-

AGENDA

- [x] present ideas
- [ ] pick top 3
- [ ] decide on team name?

① falconeer (full VR?)
- you're on a platform
- have falcon solve puzzles around you
- solve puzzle → move platform
- can pet falcon

② (AR/MR) life-size Rube Goldberg
- cranks/levers everywhere
- ball rolling → pull cranks (walk over etc.)
- further levels
  ↳ new machines

① cooking murder
- get orders
- kill customer ???

② little alchemist
- making potions
- different kind of potions
- maybe a stick you hold = wand and a book w/ recipes

③ retired box in moving company
- punch to move things
- change punch strength based on material (eg. glass)
- different kinds of punches (eg. uppercut)

↘ getting into it?

things we need to test in the future
1. hand recognition

[Context: This meeting discussed the different tech the team was going to be using.]

Tech Meeting

Leap Motion

- Doc to install
- Leap for Windows Unity, not VR

Zed

- It works, sort of!
- Borders on top/bottom of screen
- Depth sensor, it also works?
- Build doesn't work
- Works consistently on the system it's built
- Camera gets stuck in the loading loop
- Builds straight from visual studios
- Michael is going to email devs
- No object recognition yet

Vive Pro

- Removes borders
- Zed built in
- Beluga whale aesthetic
- $2000
- Tripods

Original Notes:

Tech Meeting

- Leap Motion
  ↳ doc to install
  ↳ Leap for Windows Unity, not VR

- Zed
  ↳ It works, sort of!
  ↳ borders on top/bottom screen
  ↳ depth sensor, it also works?
  ↳ build doesn't work, maybe a sign
  ↳ works consistently on the system it's built
  ↳ camera gets stuck in the loading loop
  ↳ builds straight from Visual Studio
  - Michael is gaining email dev

NO OBJECT RECOGNITION YET

Vive Pro

+ removes borders
+ zed built in

- beluga whale aesthetic
- $2,000
- tripods :(

Next Week:

- We pick our stuff

[Context: The purpose of this meeting was to go into more detail on what to prototype, as well as new/reworked ideas. After the previous meeting, we wanted to explore more mechanics that were based on more physical movements. At this point, we had added the leap motion to the tech we were going to be using, as well as discussing the possibility of a game with asymmetrical multiplayer. We had also been researching other VR games and escape rooms.]

Mechanics to Paper Prototype

- Hiding
- Searching
- Outside player interaction (what is our manual -> reference to Keep Talking and No One Explodes)
- Drawing w/ hands
- Job sim
- Pointing
    - Hand gestures
- Rube Goldberg
- Puzzle Cube
- 3D splatoon
- Punching?
- Finger guns?
- Conducting?
- Finger points?

Ideas

God Game

- Player is god
- Tribespeople
- Affect nature stuff but can't make man-made stuff
- No direct influence
- Each finger or gesture = different element
- Move around the area

Platformer dungeon

- Help little knight navigate a dungeon
- Hold platforms, etc (env.)
- Kinda like a snowglobe

Thief Puzzle Game

- Steal something without being detected
- Lazers, spotlights, etc
- Concept of "backpack"
- Indiana Jones style

- Security gets tighter as you steal more

MR Detective

- One player can see more infor about other players

Herding Game (movement)

- 1 players has headset
- Other players try to heard the animals based on player's instructions

General Game

- War map
- Action based

Sign Language game

"Keep drawing and no one dies"

- Player w/ leap motion draws
- Head set player dictates the drawing

Giant hands game

- Avoiding hands coming down?
- Human tetris?

Duck Duck Goose

MR hide and seek

Mechanics

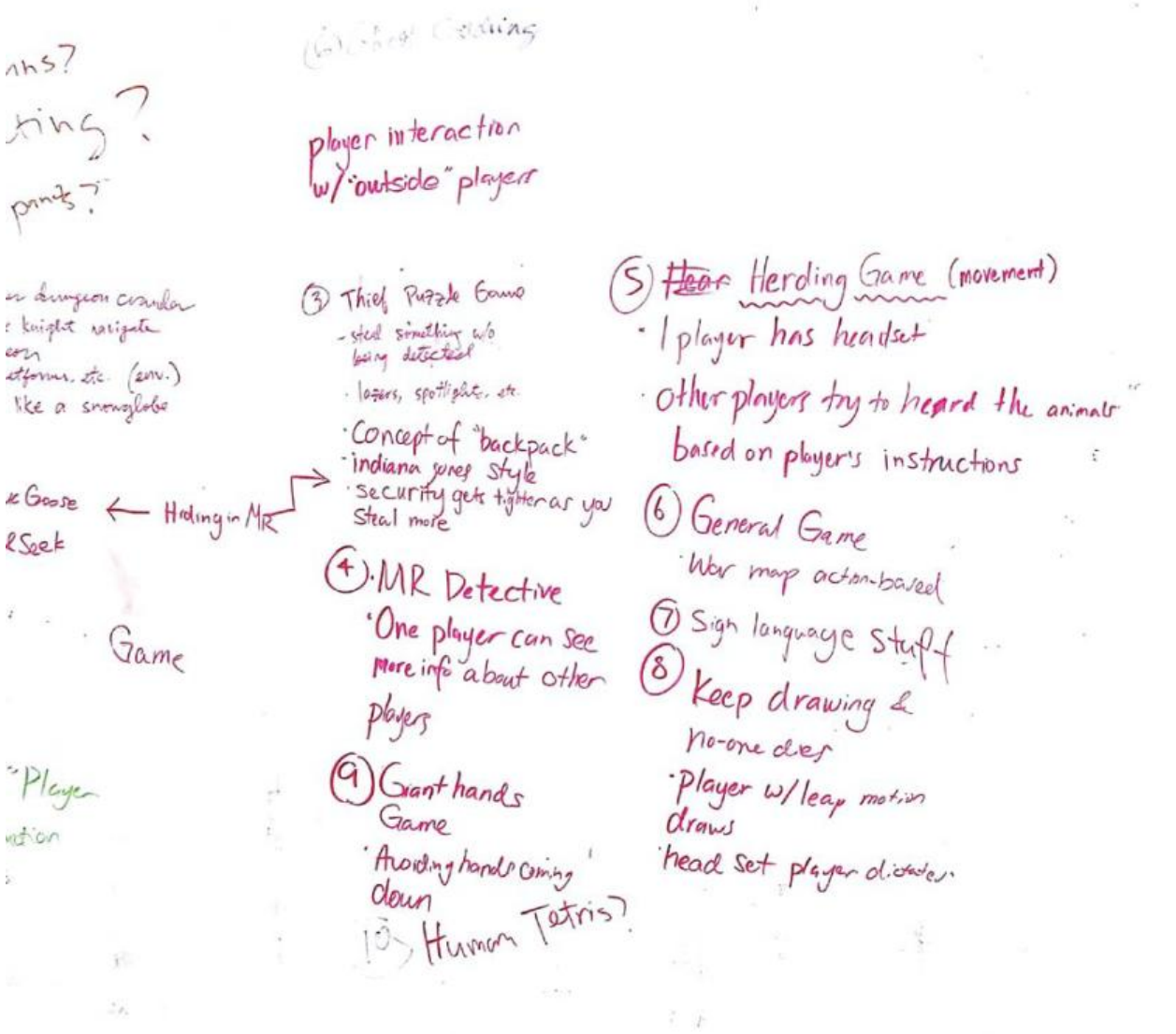
- Walking around
- Hiding/Seeking
- Sign language
- Inconvenience
- Player & outside player interaction
- Headset and leap motion on separate players

Needed for prototyping

- Hat
- Camera
- Tape

Original notes:


- plushies
- hat
- tape
- pieces? for pointing → outs!
finger guns?
conducting?
finger paints?
player interaction w/ "outside" players
Mechanics to Paper Prototype:
· Hiding
· Searching
· Outside player interaction (what is communal?)
· Drawing w/ hands
· Job Sim
· Pointing → hand gestures
· Rube Goldberg
· Puzzle Cube
· 3D Sybotoon
· Punching?
(1) GOD GAME
- player is god
- tribe people
- affect natural stuff but can't make human-made stuff
- no direct influence
- can't finger = diff. power (or gesture) element
- move around the area
(2) platformer dungeon crawler
- help little knight navigate a dungeon
- build platforms etc (env.)
- kinda like a snowglobe
Ikeana
· Duck Duck Goose
· MR Hide & Seek
← Hiding in MR
(3) Thief Puzzle Game
- steal something w/o being detected
· lasers, spotlights, etc
· Concept of "backpack"
· indiana jones style
· security gets tighter as you steal more
(4) · MR Detective
· One player can see more info about other players
(9) Grant hands Game
· Avoiding hands coming down
(10) Human Tetris?
Mechanics
· Walking around
· Hiding / Seeking
· Sign language
· Inconvenience
· Player & "Outside" Player Interaction
· Headset } keep motion separate players
Outlet Game


player interaction w/ "outside" players
③ Thief Puzzle Game
- steal something w/o being detected
· lazers, spotlights, etc.
· Concept of "backpack"
· Indiana Jones style
· security gets tighter as you steal more
Hiding in MR
④ MR Detective
· One player can see more info about other players
⑤ Herding Game (movement)
· 1 player has headset
· other players try to herd the animals based on player's instructions
⑥ General Game
· War map action-based
⑦ Sign language stuff
⑧ Keep drawing & no-one dies
· Player w/ leap motion draws
· head set player dictates
⑨ Grant hands Game
· Avoiding hands coming down
⑩ Human Tetris?
Game

[Context: At this point, we continued to move into the realm of creating an asymmetrical multiplayer and we're challenging ourselves to make the game fun for the players who weren't wearing the headset.]

Design Challenge

How do we make it fun for people NOT wearing the headset?

Pillars

1. Movement
2. Asymmetrical Gameplay -> Design for technology!

What we've done

- Test small mechanics
    - Dodging lasers
        - No haptic feedback
        - Extra bulk from equipment
    - Spotlight

Attack the Headset boy

Commander Idea

- "Shield me!"
- Changing weapons between members
- Equip, unequip

Little creatures

- Guiding them with your arms

Ghost Hunting

- Wireless headset
- Controlers vibrating

Human Voltron

- QR codes taped to body parts?

Normie Tasks (aka players without the headset)

- Reading a manual
- Feeling with vibration of controllers
- Separate senses
    - Hear
    - See
    - Feel
        - Vibrations

- Jump
- Normal person pushing the headset person

Boxing Coach

- Boxer uses controllers, coach uses headset
- Opponent is after the coach

Haircut Idea

- Normal person is the barber and headset person directs them

See auras around people

- Evil? Good?
- Bluffing

Doctor Idea

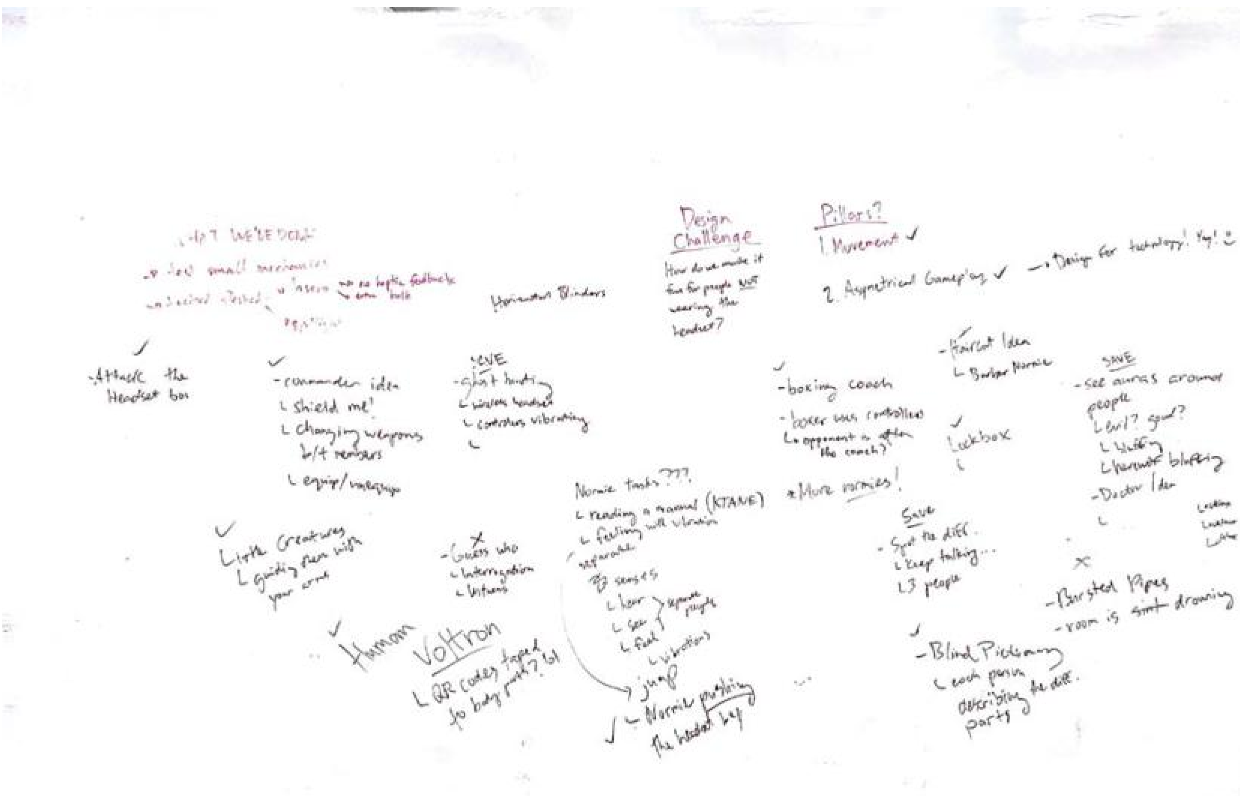
Bursting Pipes

- Room is flooding

Blind Pictionary

- Each person describing the different parts

Original Notes:


Design Challenge
How do we make it fun for people NOT wearing the headset?
Pillars?
1. Movement
2. Asymetrical Gameplay
Horizontal Blinders
Attack the Headset box
commander idea
shield me!
equip/unequip
Little Creatures
guiding them with your arms
Guess who
Human Voltron
QR codes taped to body parts?
Normie tasks???
reading a manual (KTANE)
senses
jump
boxing coach
Haircut Idea
Barber Normie
Lockbox
*More normies!
SAVE
see auras around people
Doctor Idea
Save
Spot the diff.
Keep talking...
3 people
Blind Pictionary
Bursted Pipes
room is slowly drowning

[Context: Sticking with the asymmetrical gameplay element, this was one of the most fleshed out idea we had come up with for that particular pillar.]

Players are wizards, their goal is to summon the correct creatures before the evil wizard king gets revived (a time limit).

Players need to look for “hotspots” where treasures are hidden around the space.

Players have a physical spellbook (manual) to help them.

MR person needs to collect Mana Fire blobs then draw the correct symbol based on the treasures around them. Regular people use controller. The closer they are to a treasure, the more it vibrates (like a metal detector). ANYONE can look at the spellbook.

They need to take into account the positions of the treasures – the MR person will need to draw a different symbol depending on the positions and types of treasures they find (example: if 4 treasures are all on one side and one of them is a crown, the MR person needs to draw a star).

Gameplay loop

- Normal players unearth treasures in the “hotspots” w/ controllers
- MR player looks at what treasure they unearthed
- They look at the spellbook to determine what symbol needs to be drawn (depending on number, position, and types of treasure)
    - Meanwhile, MR person collects Mana Fire Boys floating around
- MR person draws symbol (if they have enough mana)
- Creature is summoned!

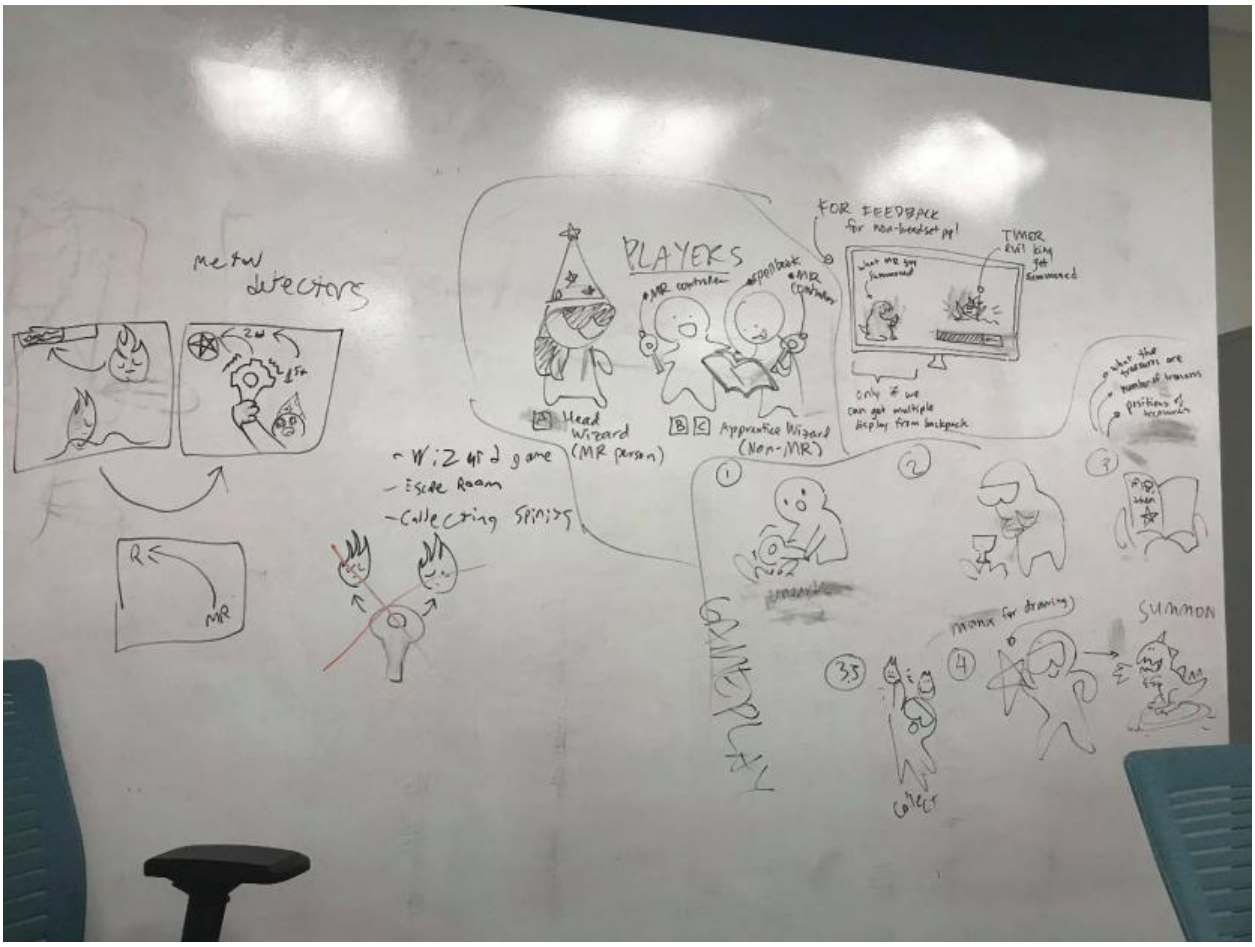
-Separate screen: there will be a different screen or a monitor that’s just a timer everyone can look at. It’ll have an animation of the evil wizard king being summoned. This is so that the regular playersalso know what’s happening in the game.

Comments from Jon (Art Mentor):

- Incentive to finish game, only cutscenes might just be super underwhelming unless it’s face-meltingly beautiful (which it won’t be)
- Suggestion: Throughout the game, all players are playing asymmetrically. But maybe at the end, they could all work together for a final push.

Original Notes:


evil


PLAYERS
FOR FEEDBACK
for non-headset ppl
TIMER
Head Wizard (MR person)
Apprentice Wizard (Non-MR)
- Wizard game
- Escape Room
- Collecting Spirits
GAMEPLAY
SUMMON
COLLECT

[Context: These are other fleshed out ideas we came up with while following the route of the asymmetrical gameplay.]

Pillars:

- Movement
- Asymmetrical
    - 2+ way communication
    - Competition

Agenda

- Flesh out 2-3 ideas
- Decide on what to test

References

- Artemis
- Space Team

Ideas

Co-op flowers

- Like splatoon but with flowers instead of paint

Mario Party or Snipperclips

- Roomwide
    - Do counters
- No dodging
- Why Move?

Monster Hunter

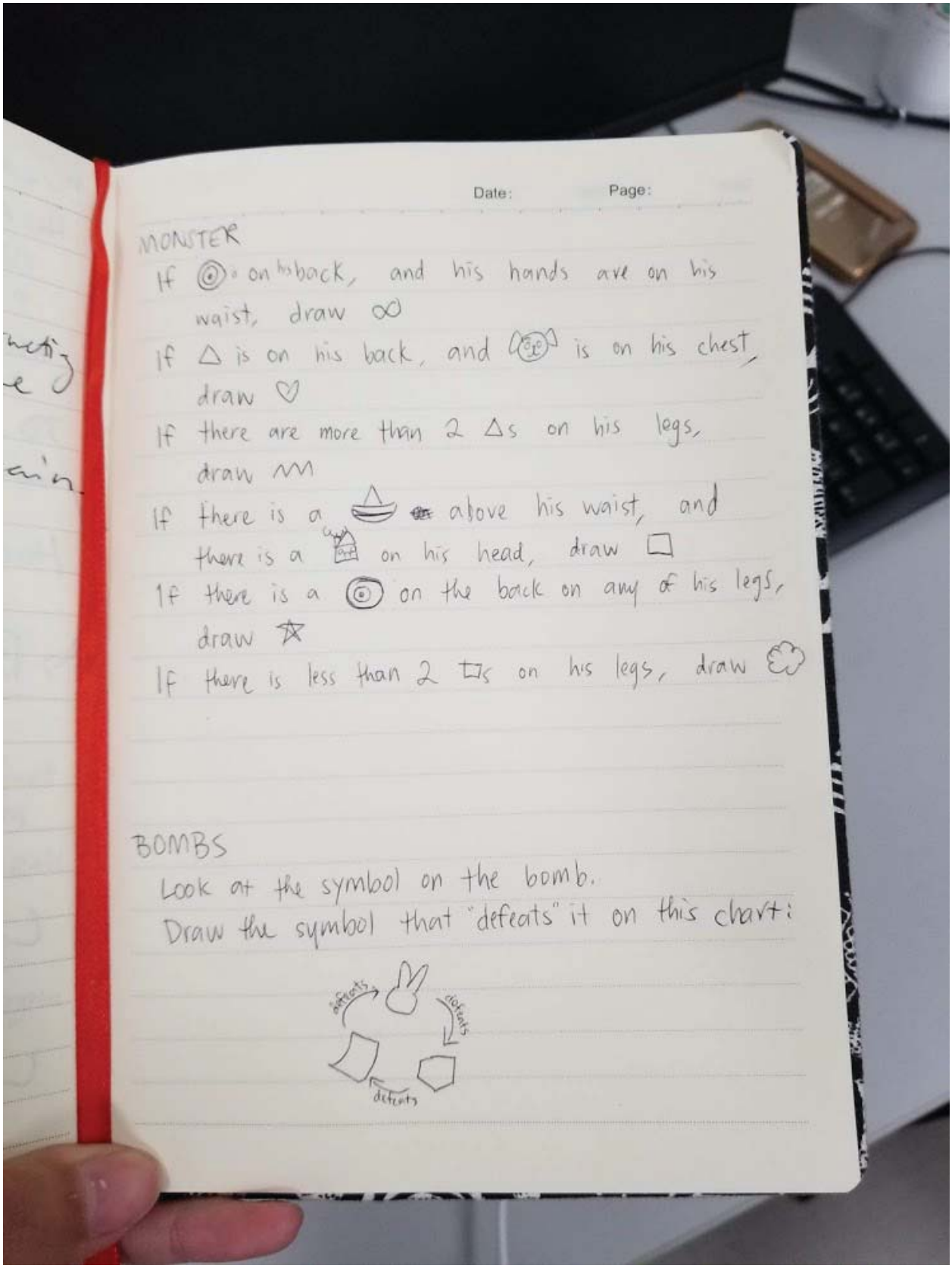
- MR guy
    - Kills monster
- Normal person
    - Looks at encyclopedia to learn how to kill monster
- MR
    - Magic hands
    - Monster out of the ground
- Monster
    - Stays in one place
    - Different attributes on different body parts
- Advantages of MR
    - See teammates
    - Leap Motion with real hands
    - Magic hands
    - Creatures on desks

- Tied to locations

Monster Hunter mechanics to test

- Position yourself and drawing spells
- Co-op

Original Notes and Example of puzzle for the Monster Hunter idea:



Date: Page:

MONSTER

If ◎ on his back, and his hands are on his waist, draw ∞

If △ is on his back, and (ಠ_ಠ) is on his chest, draw ♡

If there are more than 2 △s on his legs, draw ᔓᔓ

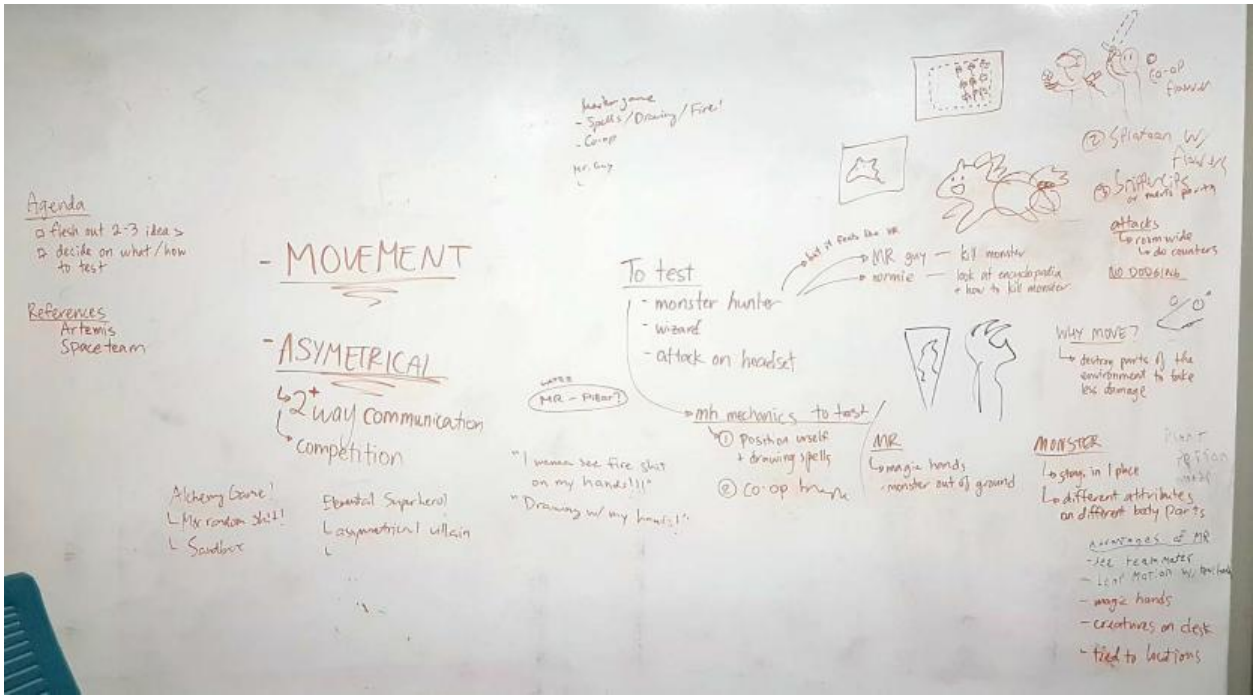
If there is a above his waist, and there is a on his head, draw □

If there is a ◎ on the back on any of his legs, draw ☆

If there is less than 2 □s on his legs, draw

BOMBS

Look at the symbol on the bomb.
Draw the symbol that "defeats" it on this chart:


Agenda
flesh out 2-3 ideas
decide on what/how to test
References
Artemis
Spaceteam
- MOVEMENT
- ASYMETRICAL
2+ way communication
competition
Alchemy Game
Mix random skill
Sandbox
Elemental Superhero
asymmetrical villain
Monster game
- Spells/Drawing/Fire
- Co-op
To test
- monster hunter
- wizard
- attack on headset
MR guy — kill monster
normie — look at encyclopedia + how to kill monster
mh mechanics to test
1 position urself + drawing spells
2 co-op
MR
magic hands
monster out of ground
"I wanna see fire shit on my hands!!!"
"Drawing w/ my hands!"
Co-op
Splatoon w/
attacks
to do counters
WHY MOVE?
destroy parts of the environment to take less damage
MONSTER
to stay in 1 place
different attributes on different body parts
- see teammates
- magic hands
- creatures on desk
- tied to locations

[Context: This meeting was really a turning point for us. Instead of focusing on different ideas and mechanics, we began to the UX first. Asymmetrical gameplay was scrapped at this point so we could focus on the UX of just one player.]

What did we do? (Summary of meeting)

- Find mechanics, stripped game to its core
- Tentative game idea
- Determine set up
    - Attracting players
    - Hardware setup
- Target demographic
    - Who would wear the backpack/equipment
    - How to get them to wear it?

Questions

- How do we get them to wear the backpack?
- What is our target demographic?

Things to think about

- Think about display/décor
    - Decorate the space
    - Decorate the equipment
    - Mirror the display of MR player + leap motion
        - The fun is seeing yourself in snapchat filter
    - Happy Fun Times
    - Staff/others are in costume to match player
        - Helps with not feeling embarrassed to do it alone
        - Add context to why we're wearing this?
- There's an inherent silliness with MR
    - More comfortable to play with friends and family
    - Makeup/dressed up -> less inclined to wear backpack and needs more commitment

Who would put on the backpack?

- Teenagers or friends who see this as one giant snapchat filter
    - Mostly teenage girls (boys might find it embarrassing)
- 35 year old dad at the mall with his kids and wants them to be interested in tech
- Mid 40s dad who wants to embarrass his 14 year old son
- Couples: Mid 20s boyfriend and girlfriend
- Mid 30s LOTR/DND fan who likes mystical creatures and wants to interact with them
- FOCUS: playing together in a group.
    - Interaction
        - Puppet Master IK

        - Journey
        - HappyFunTimes
            - Might be stacked on unnecessarily

Setup

- Consider time and effort
- Optional goal
- Physical booklet of lore

Tasks

- Low priority
    - Localization considerations

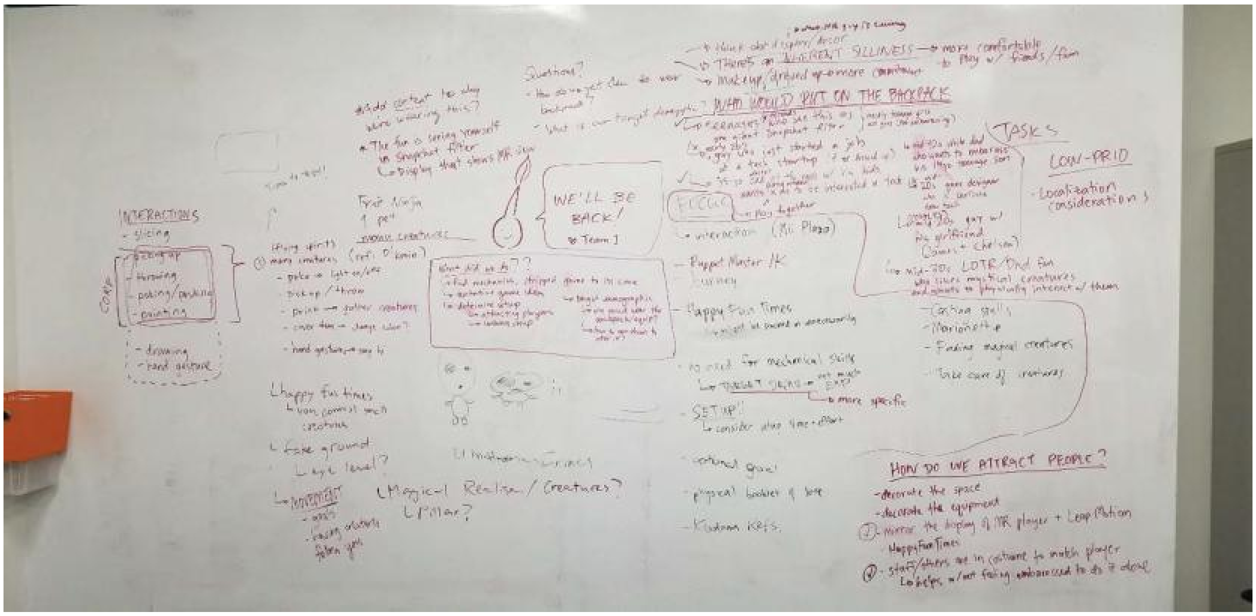
Potential Design

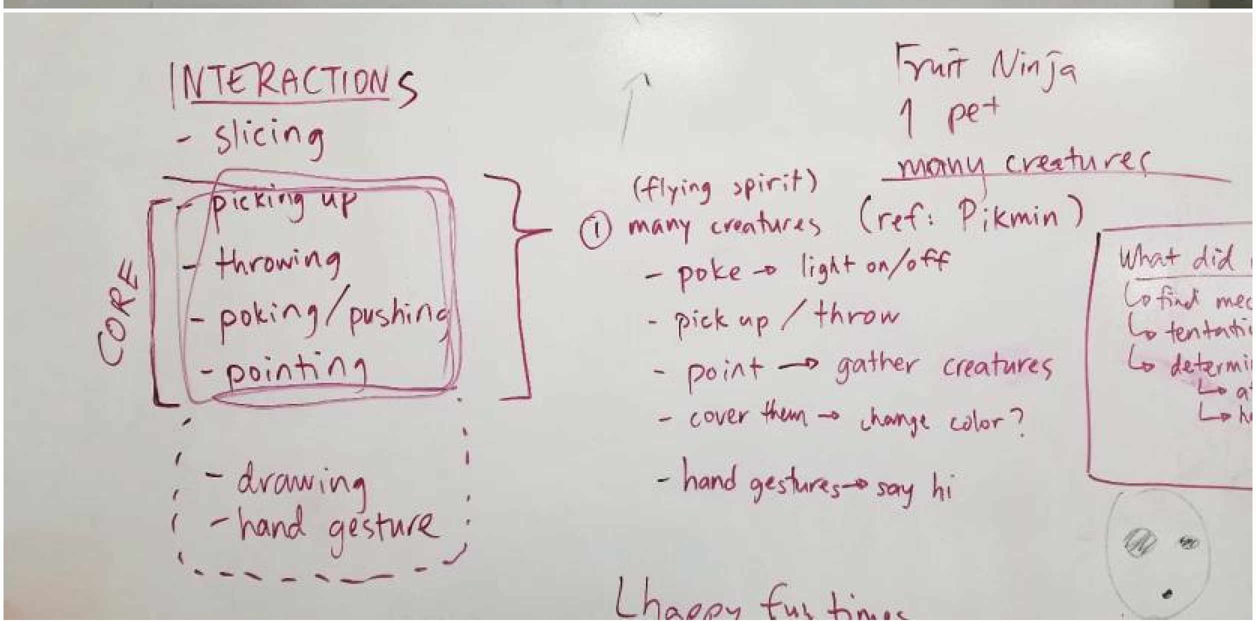
- Many flying creatures
    - Interactions include:
        - Poking
        - Picking up
        - Throwing
        - Pushing
        - Pointing (gather creatures in one area)
        - Drawing
        - Slicing
        - Covering them (change colour?)
        - Other hand gestures
    - HappyFunTimes
        - Other people control the creatures
    - Fake ground
        - Eye level?

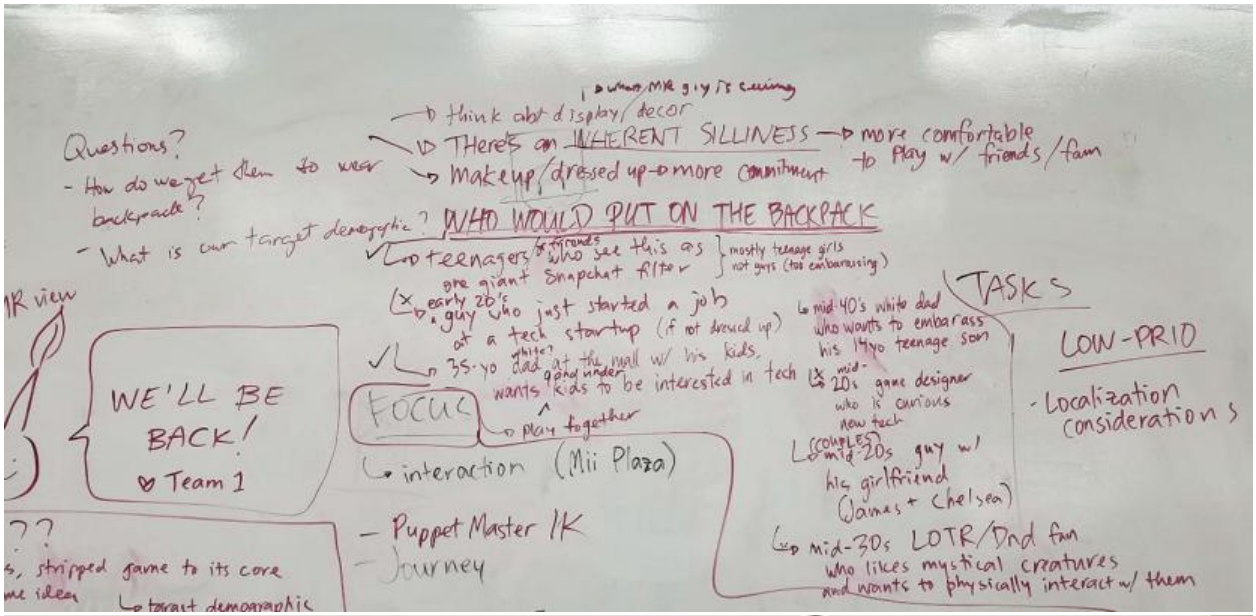
Pillars

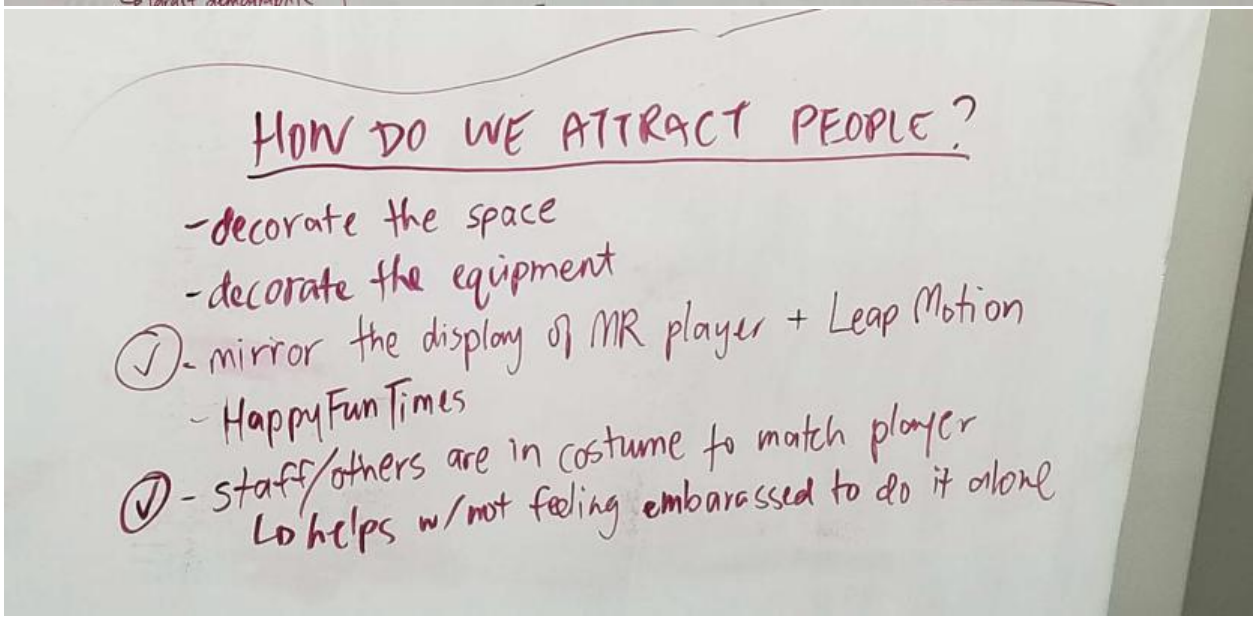
- Movement
    - Goals
    - Having creatures follow you
- Magical realism

Original Notes


INTERACTIONS
WE'LL BE BACK!
WHAT WOULD PUT ON THE BACKPACK
TASKS
LOW-PRIO
HOW DO WE ATTRACT PEOPLE?
-decorate the space
-decorate the equipment


INTERACTIONS
- slicing
- picking up
- throwing
- poking/pushing
- pointing
CORE
- drawing
- hand gesture
Fruit Ninja
1 pet
many creatures
(flying spirit)
① many creatures (ref: Pikmin)
- poke → light on/off
- pick up / throw
- point → gather creatures
- cover them → change color?
- hand gestures → say hi
What did


Questions?
- How do we get them to wear backpacks?
- What is our target demographic?
think abt display/decor
THERE'S an INHERENT SILLINESS
makeup/dressed up → more commitment
more comfortable to play w/ friends/fam
WHO WOULD PUT ON THE BACKPACK
teenagers & friends who see this as one giant Snapchat filter
mostly teenage girls not guys (too embarrassing)
early 20's guy who just started a job at a tech startup (if not dressed up)
35-yo white dad at the mall w/ his kids, guy under wants kids to be interested in tech
mid-40's white dad who wants to embarass his 14yo teenage son
mid-20s game designer who is curious new tech
(couples) mid-20s guy w/ his girlfriend (James + Chelsea)
mid-30s LOTR/DnD fan who likes mystical creatures and wants to physically interact w/ them
TASKS
LOW-PRIO
- Localization considerations
WE'LL BE BACK!
♡ Team 1
FOCUS
play together
interaction (Mii Plaza)
- Puppet Master VR
- Journey
MR view
stripped game to its core
target demographic


HOW DO WE ATTRACT PEOPLE?
- decorate the space
- decorate the equipment
✓ - mirror the display of MR player + Leap Motion
- HappyFunTimes
✓ - staff/others are in costume to match player
→ helps w/ not feeling embarassed to do it alone

[Context: This is the meeting in which what would later become Booyo Park is beginning to take shape.]

Pillars

- Movement
- Magical Realism
- Hand Recognition

Mechanics

- Drawing their path
    - Obstacles around the space
- Bubble creation/popping
- Poke/pushing
- Pointing
- Throwing
- Hand gestures OR drawing

Refs

- Magic Touch
- Kirby Canvas

Hand Gestures

- Waving
- Thumbs up/down
- Camera
- Shadow puppets
- Drawing
    - Non MR players draw symbol that MR player has to draw
    - Trace vs free draw

Push/Poke

- Bubbles
    - Creatures trapped inside
    - Jello
- Knock stuff over
- Buttons/pads/screens

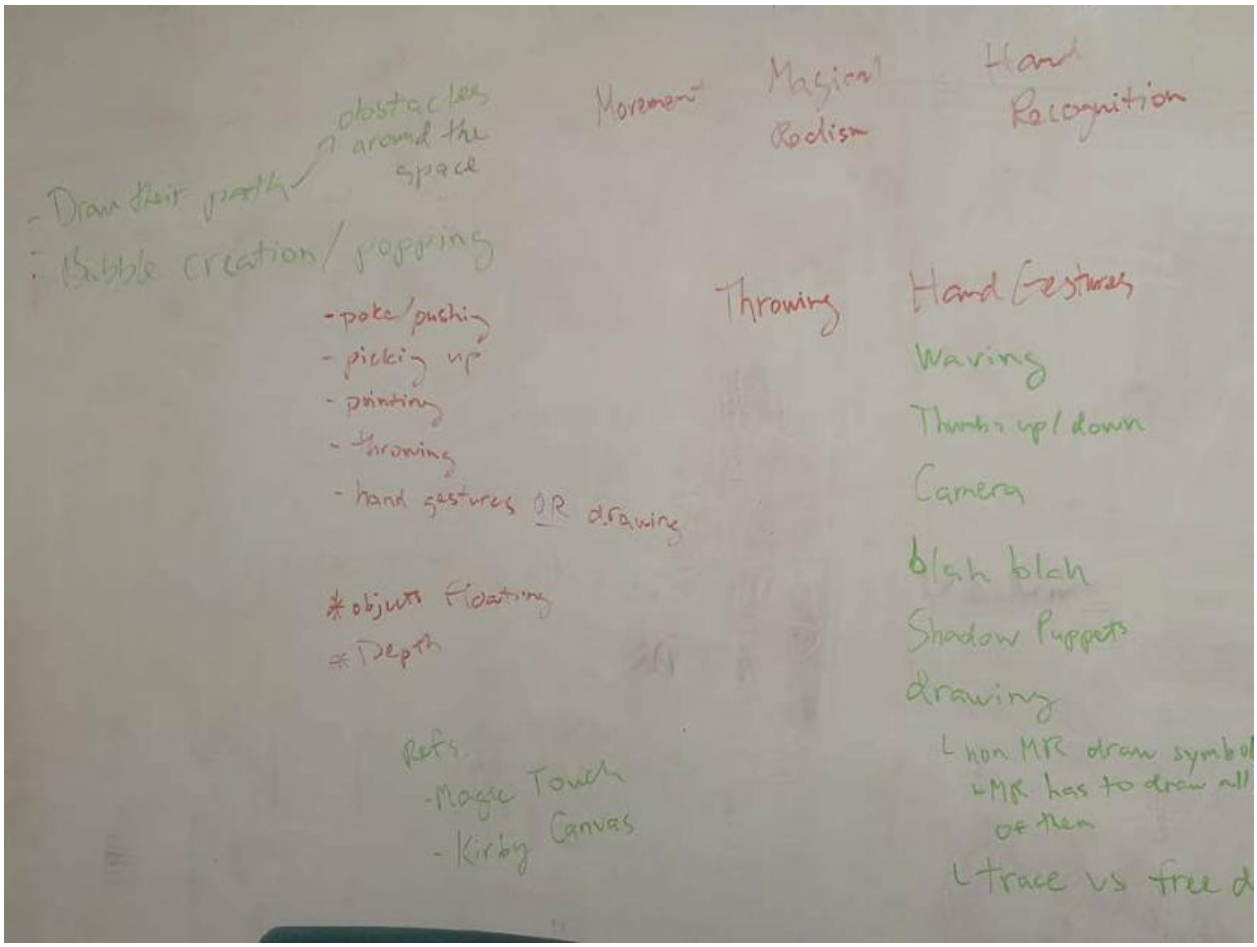
Picking Up

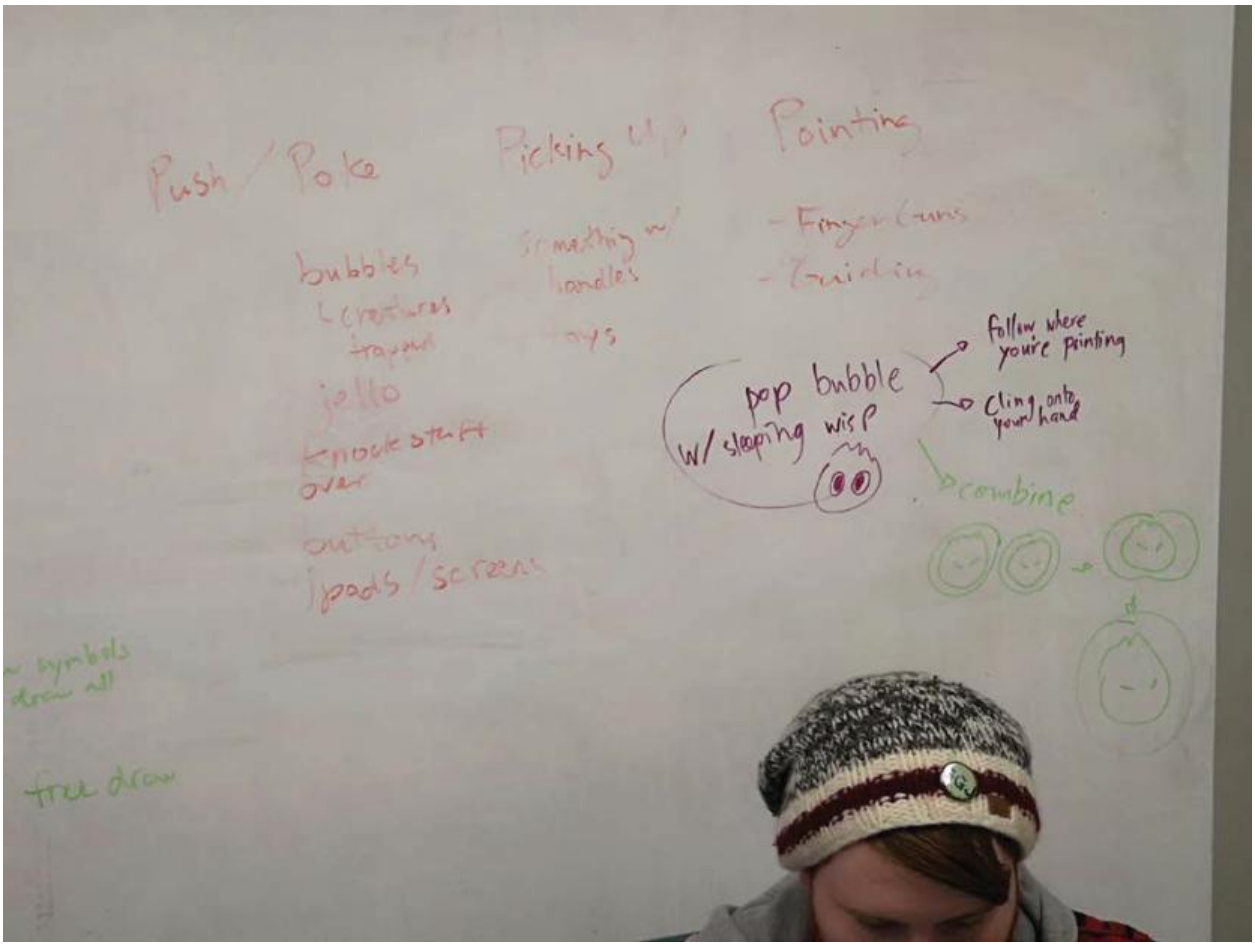
- Something w/ handles
- Toys

Pointing

- Finger Guns
- Guiding

Original Notes:


- Draw their path → obstacles around the space
Movement
Magical Realism
Hand Recognition
: Bubble creation / popping
- poke/pushing
- picking up
- pointing
- throwing
- hand gestures OR drawing
Throwing
Hand Gestures
Waving
Thumbs up/down
Camera
blah blah
Shadow Puppets
drawing
* objects floating
* Depth
Refs.
- Magic Touch
- Kirby Canvas


Push / Poke
Picking up
Pointing
bubbles
creatures
trapped
jello
knock stuff over
buttons
ipads / screens
- Finger Guns
pop bubble w/ sleeping wisp
follow where you're pointing
Cling onto your hand
combine
free draw

[Context: In this meeting, we discussed why people should care about our work, and what potential uses the framework we created could apply to. This was discussed in preparation for our application for College Day at Queen's Park, which was ultimately accepted.]

Why should people care?

Practical application potential

- Engaged learning
    - Interaction = engagement
- Potential for museums, zoos, etc
    - Eg Aztec community walkthrough, etc
- Learning and discovery
- Virtual companions
- Location based experience
    - Compare to VR
        - Hard to set up at home
    - MR
        - Portable and can be used anywhere

Keywords

- Interaction
- Freedom of movement/portability
- Curiosity
- Virtual companions

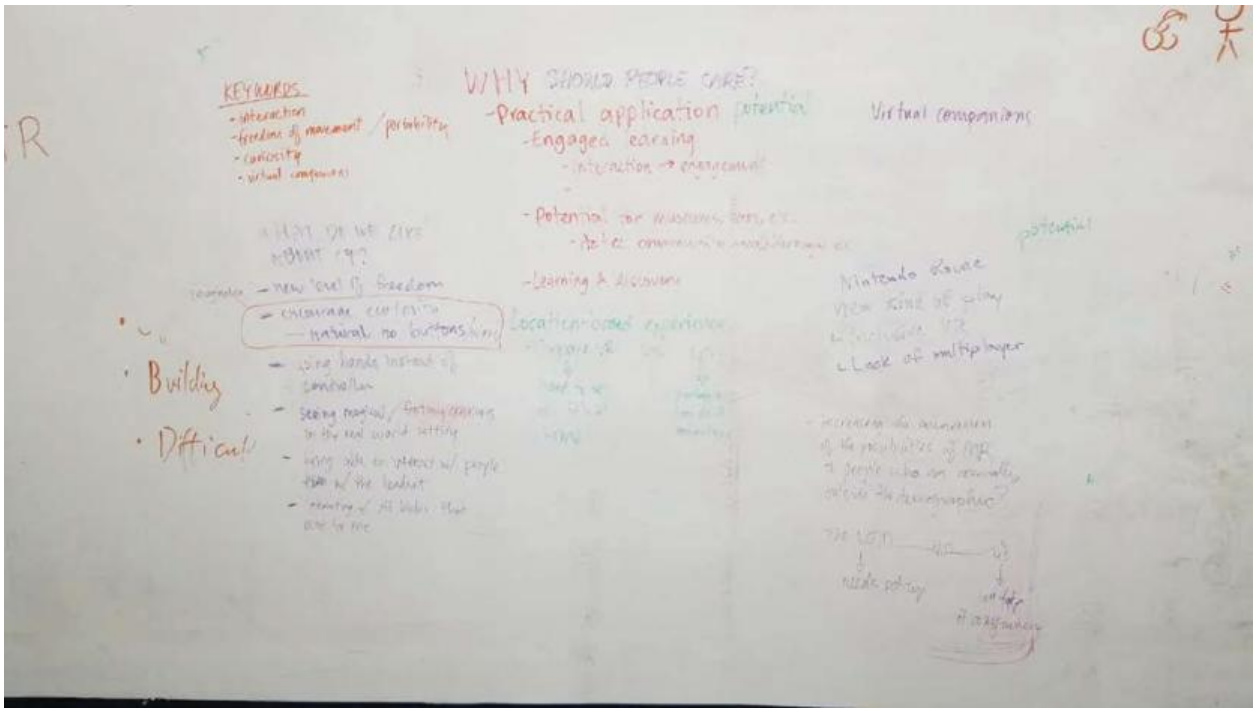
What do we like about it?

- New level of freedom
- Encourage curiosity and imagination
    - Natural, no buttons/wires
- Using hands instead of controller
- Seeing magical/fantasy creatures in the real world setting
- Being able to interact with people even with the headset on
- Interacting with AI blobs that react to player

Potential directions

- Nintendo Route
    - Inclusive VR
    - Lack of multiplayer
- Increasing the awareness of the possibilities of MR to people who are normal outside the demographic
- Portability
    - Unlike The Void, it can be set up anywhere

Original Notes:



Idea: Be kind of like a safari, where booyos change colours depending on their location.

- Can't have a set location within the play space that changes the colours of the booyos because every space we set up in will be different
    - If it was a permanent installment in a mall or a hospital, it'd be different because the location always stays the same and can be mapped out in Unity
- Position direction?
    - Have the colour change based on the direction the player moves or their position
- Player camera has always been finnicky, and is currently causing problems for the tech team, so it'd be safer not to rely on player position

Outcome:

- Booyos are like chameleons that change colour based on their environment
    - Example: in one room they're blue, in another they're purple
        - Might have accessories, like glasses at the library (low priority)
    - Can demonstrate in video that they appear different in different locations

Roles for Playtest

Jen- Note taker - making observations, getting people to fill out surveys

James - Person talker @ booth (parents watching their kid)

Michael - Dedicated backpack dude

Justin - Dedicated backpack dude

Yani - Person talker @ booth

Keana - People wrangler (sales pitch)

VIDEO

-Extra monitor
-fold up tables

Plan layout

Offboarding
--ends when booyos fly up one by one and then fades to black with logo?
-Booyo sticks/fans (HEWWO IT'S HOT)
    -hold fans hostage
    -thank people for playing and ask them to take a fan (yani and james)

Onboarding
-video
-team members talking to them
-

Putting on backpack
-Justin and Michael put on the backpack
    -explanation if needed.
-please buckle the buckles, adjust the headset with the knob at the back until you are comfortable
-glasses can be worn if you'd like to keep them on
-Enjoy your experience at Booyo Park!

Taking off backpack

-player takes off headset
-alright how was your time at booyo park
-help them out of back
-thank you so much for visiting, feel free to take picture with banner and take a booyo fan as a souvenir
Thanks agaiN!

Intro
-Single booyo appears just out of reach
-player walks up to booyo and touchs them
-all the other booyos appear and fun begins
-if they don't touch the booyo within 10 seconds, booyos appear automatically

Appendix J: Documentation of Public Events

These are notes that we took to **explain the public events** we went to, with accompanying photos.

Gaming Expo 2019

Oakville Public Library - Iroquois Ridge Branch, Oakville

March 30, 2019

Sheridan College partnered with the Oakville Public Library to hold the Gaming Expo. This event had two purposes:

1. Show the local community what can be done in the game development scene
2. Test our games in a public space with an audience that was from varied demographics.

Until now, we had been testing *Booyo Park* in the studio and in very controlled environments. The Gaming Expo was our chance to see how our game fared with a more diverse set of people and to practice our showcase/setup workflow in a more spontaneous atmosphere.

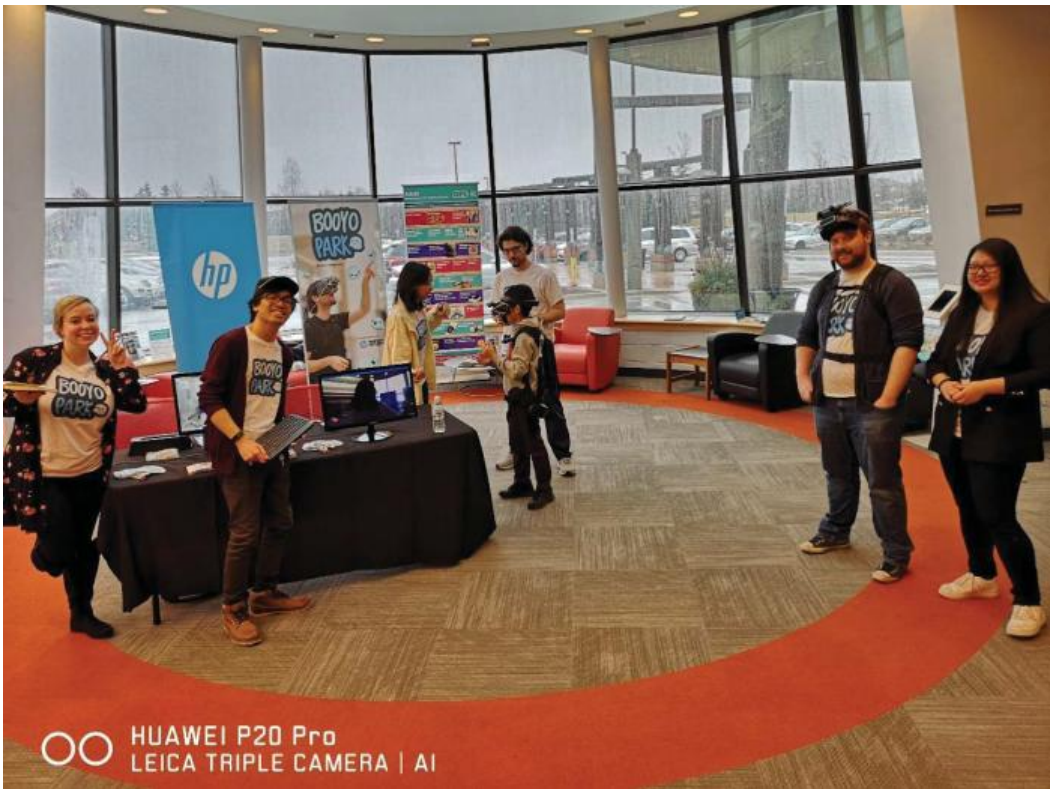


Photo 1. Hexabyte! at the *Booyo Park* space inside the Oakville Public Library.

Photo 2. Jennifer Stienstra helping out a child who was too little for the VR backpack.

Photo 3. A child placing a Booyo into his father's hand.

Photo 4. A child holding up a Booyo.

Photo 5. Yani Wang wearing the 'dummy' set (VR backpack and headset that are powered off) beside a child playing *Booyo Park*.

Photo 6. Reporters playing *Booyo Park* for their story.

2019 College Day exhibit

Queen's Park Main Legislative Building, Toronto

April 1, 2019

Every year, Colleges Ontario holds a prestigious event called College Day at Queen's Park, Toronto. The exhibit's general audience includes college presidents, board chairs, government officials, and Members of Provincial Parliament (MPPs).

There are 43 colleges in Ontario, and each college selects one project to represent it. Sheridan College selected *Booyo Park* as its representative. Colleges Ontario then looks at the 43 projects then selects around a dozen. We were happy and humbled that *Booyo Park* was selected to showcase at the College Day exhibit!

The Sheridan College group consisted of James Pratt, Michael Arcadi, and our team's mentor Jose Rueda. Hans Bathija, an executive at Shadow Factory, also came to visit the exhibit.

College Day was a great opportunity to test *Booyo Park* on a high-profile and business-minded audience. Contrary to our mindset during the Gaming Expo (Oakville Public Library), we had to pitch and exhibit in a totally different manner, focusing on the real-world applications and possible benefits of *Booyo Park* as a product.

Photo 2. Backpack-wearing Hexabyte! representatives with Sheridan College president Dr. Janet Morrison (middle).

Photo 2. Hans Bathija, James Pratt, Michael Arcadi, and Jose Rueda posing in front of the *Booyo Park* booth.

Photo 3. Various equipment in the booth. An explanation video plays on loop for guests to watch while waiting for their turn.

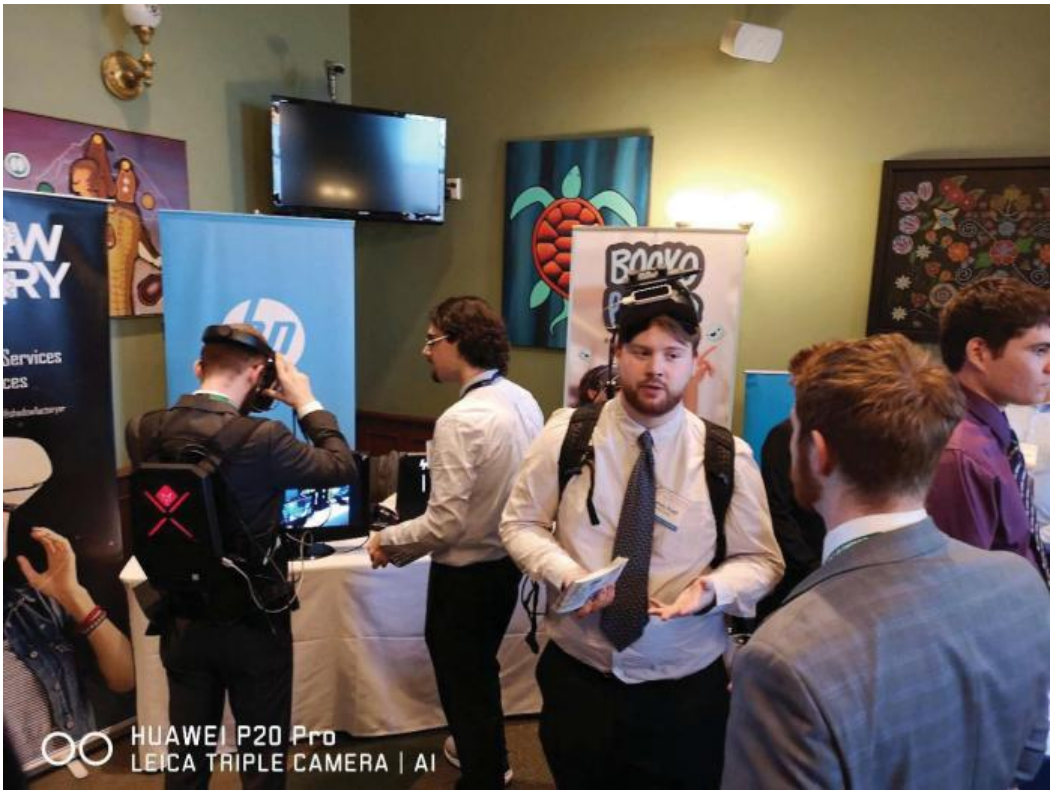


Photo 4. Michael Arcadi and James Pratt informing guests about the project.

Photo 5. A guest talking to Michael Arcadi while wearing equipment.

Photo 6. Michael Arcadi and James Pratt having some fun!

Appendix K: Presentation Materials

These are each of our slideshows during the project. This is what we **presented to various guests** each week, based on a variety of prompts. Since we had new guests every week, we would introduce the project and the team every time.

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1






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Design Lead

Michael Arcadi
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Justin Capcap
Technical Designer

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Art Lead

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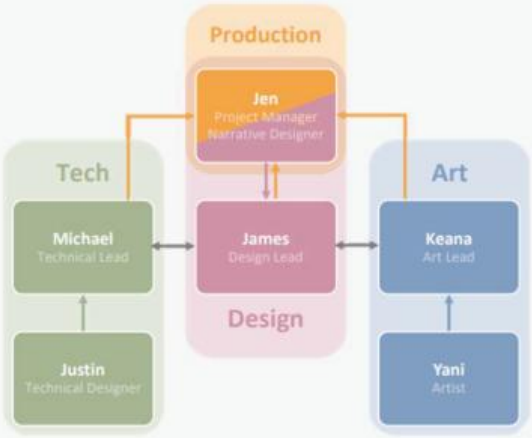
Meet the Team

Design challenge by: SHADOW FACTORY

2

voodoo

Roles and Governance



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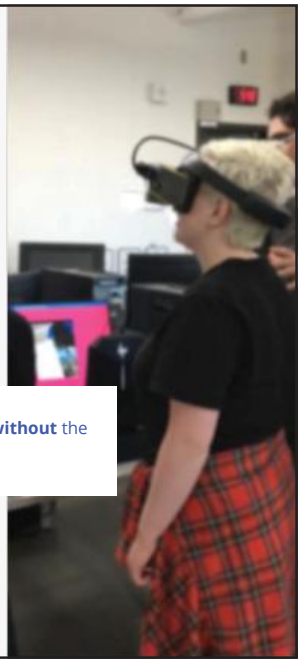
Our Goal

Our **goal** is to create a **fun location-based Mixed Reality** game that can be played **without** the **restriction** of cables.



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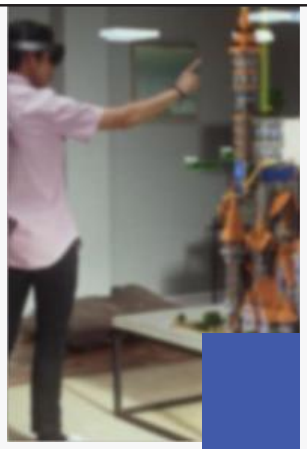

Our Scope

We want to create a **single-player** game meant to be played **indoors**. The game will utilize the strengths of the tech provided, especially its **portability** and **Mixed Reality capabilities**. We're aiming for a **working** and **polished proof-of-concept**.

5

The Technology

HP Windows MR Headset

The headset that can track your movements and line of sight for a fully immersive experience.

HP Omen X Compact

A powerful PC that allows us to move around and take our game with us without cables tying us down.

Zed Camera

A camera that senses space and motion with high resolution and frame video capture and also depth and positional tracking.

What we've done

- Past experience developing with VR technology
- Past experience with working together in many game jams and academic projects.
- We have created several **award-winning** games.
- We've been featured in several different articles, podcasts, and interviews on **Kotaku, the Sheridan Sun, 3rdperson**, and **more**.
- We've shown off games at local and international conventions such as the **Toronto Comics Arts Festival, QGCon, Bit Bazaar,** and **more**.

7

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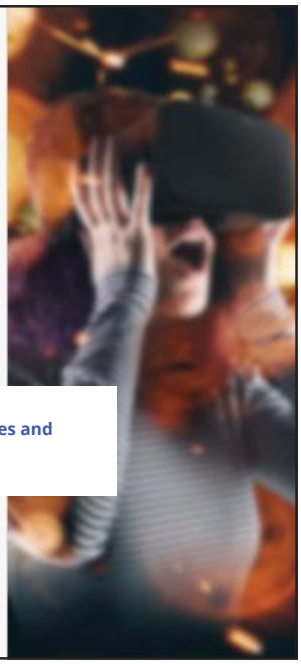
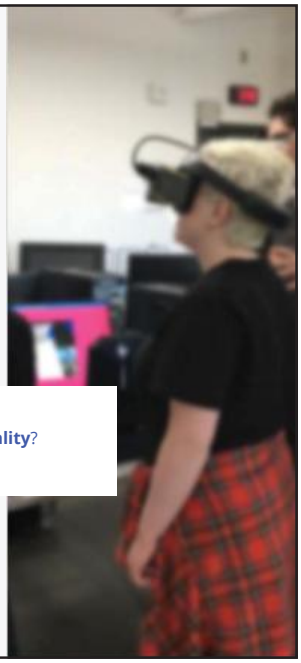


"What would be **cool** in terms of gameplay that allows players to **move around spaces and buildings** without the **restrictions of cables?**"

3

Design Challenge



How do we create **asymmetrical gameplay** in which only one player is in **Mixed Reality**?

4

Movement

Asymmetrical Gameplay

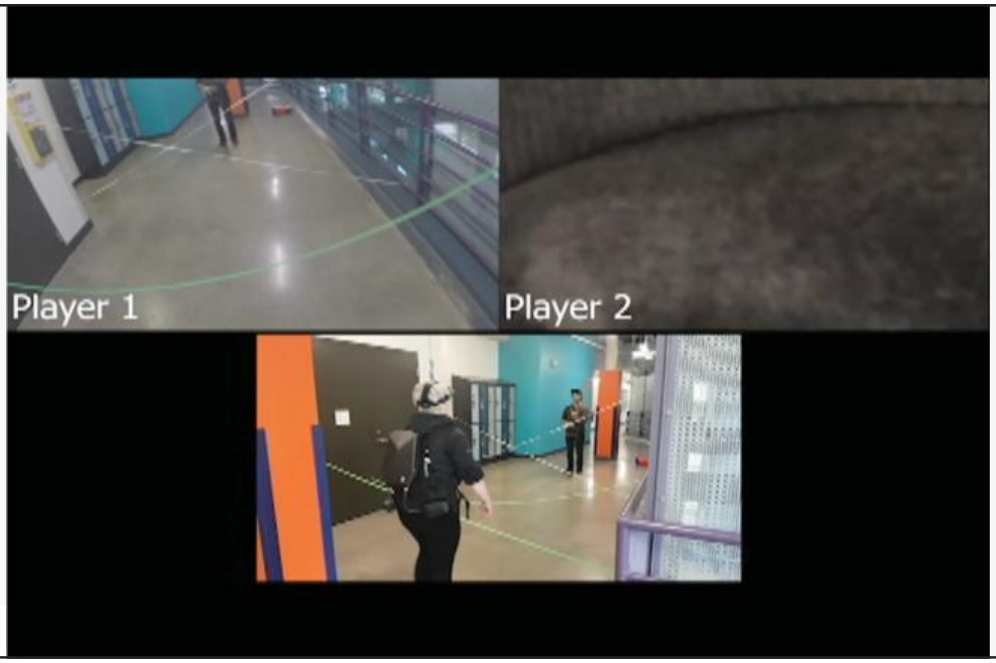
Game Pillars

5

Prototyping

We used our phones and a GoPro to capture the **perspective** of players. Then, we tried out **multiple mechanics** to see what worked.

6



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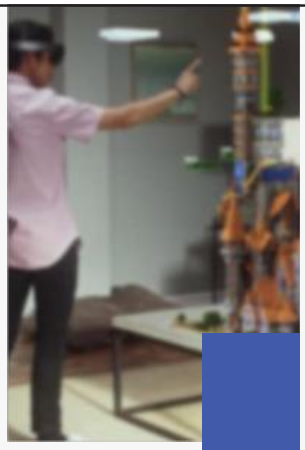


What We Learned

We found that **searching** and **navigating** around an **environment** works well with the **tech**.

We also learned that **asymmetrical multiplayer** proposes an **interesting design challenge** that we want to pursue.

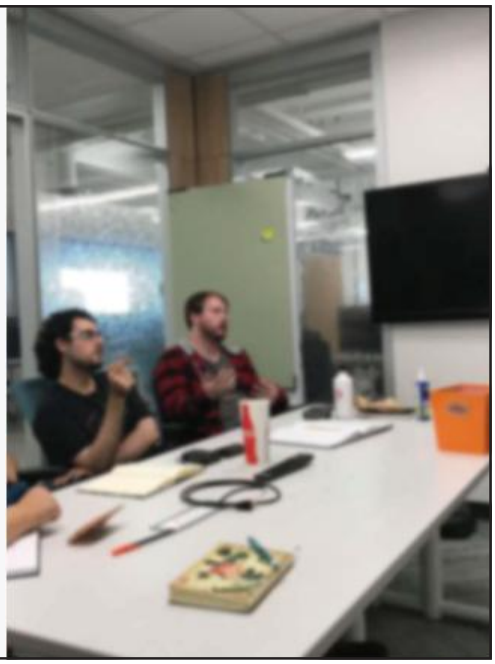
8

Next Steps

Continue prototyping different mechanics and approaches.

Decide on a solid game idea.

Elaborate on details to the GDD.



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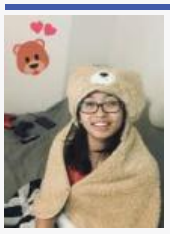


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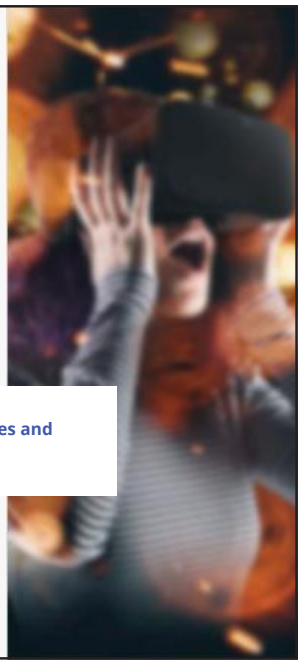


"What would be **cool** in terms of gameplay that allows players to **move around spaces and buildings** without the **restrictions of cables?**"

3

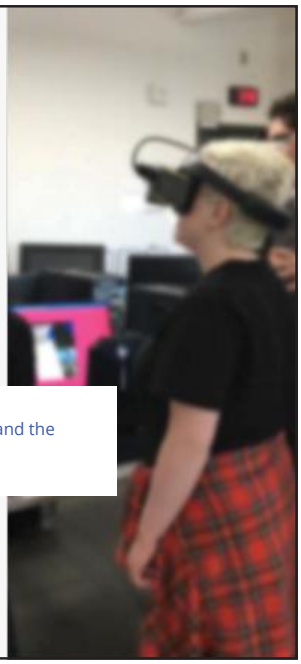
Previously...

We were focused on:

- **Gameplay** mechanics
- Ideas that work with the **tech**
- **Asymmetrical** multiplayer

4

Design Challenge



How do we make an experience that's **engaging** to both the **player** in Mixed Reality and the **spectators** in the real world?

5

Since Last Time

We had a meeting with our mentor and **Kieran Lovett** of **Shadow Factory.**

We shifted our **focus** on the entire user experience.

"In many games, UX is thought of last. If we focused on UX, we can reskin our project for any game."

6

Movement

Magical Realism

Hand Gesture Interaction

Game Pillars

7

Before and After

Before, we **focused** a lot on our **asymmetrical multiplayer** pillar. Our idea became **complex**, and the gameplay **overshadowed** the tech.

Now we are focusing on the **player experience** and interacting with a virtual environment, specifically **mystical creatures** that would be otherwise "invisible". This includes poking, pointing, throwing, and picking up the little creatures.

8

Next Steps

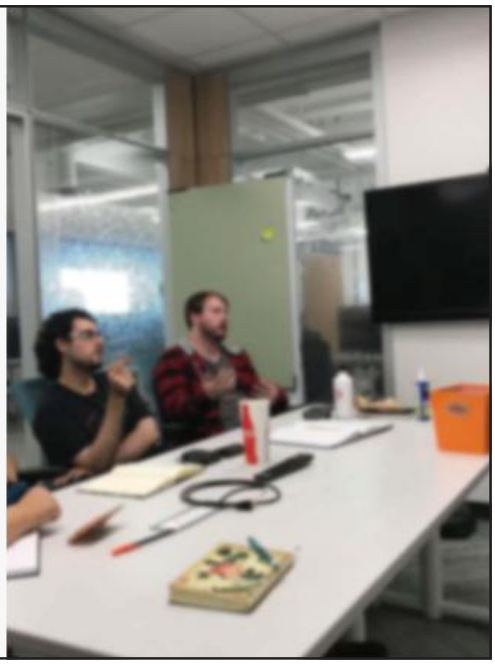
Based on feedback, we will:

Focus on user experience.

Define our target demographic.

Continue to update Keiran weekly.

Take a different approach to prototyping.



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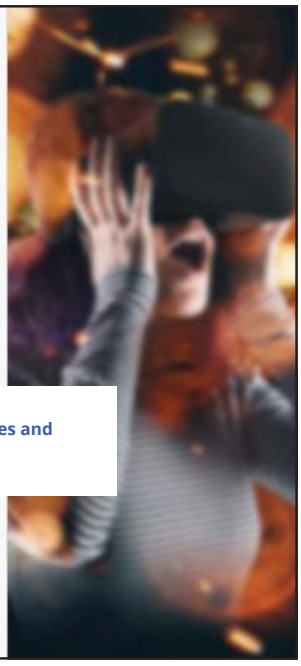

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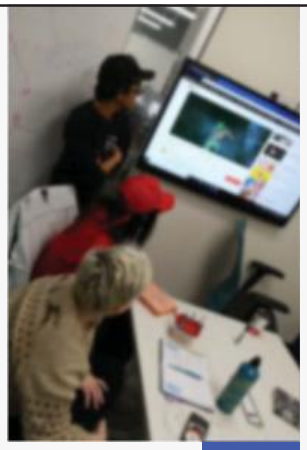


Since Last Time

Talked with Shadow Factory.

Focused on the UX of the entire experience.

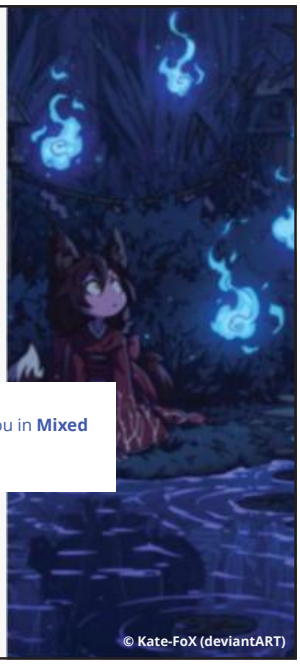
Settled on a game idea.

Made technical progress.

Started production.

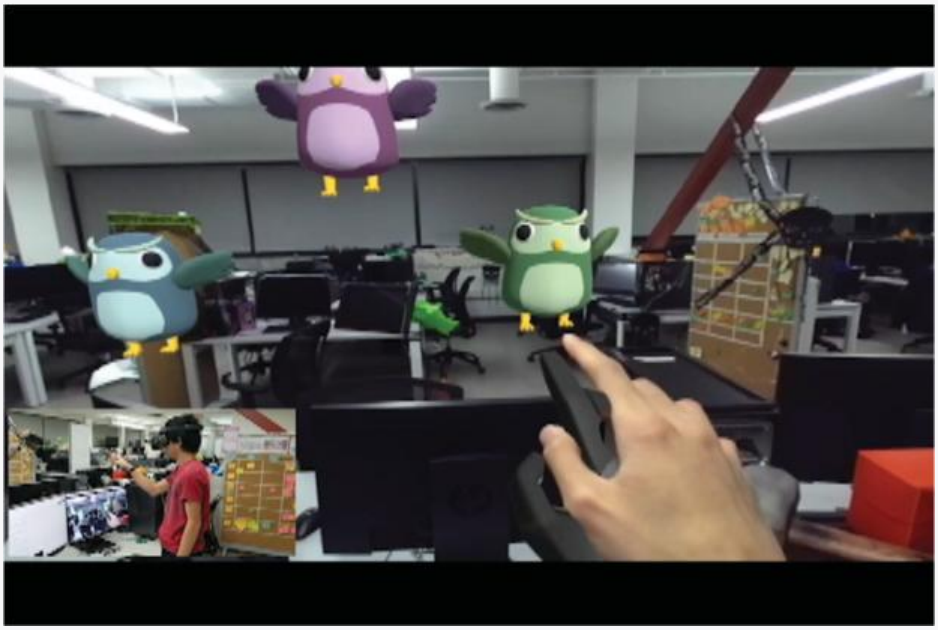
4

Game Premise



An interactive **sandbox** experience where you interact with **floating wisps** around you in **Mixed Reality**.

5



6

Next Steps

Design:

- **Continue** to playtest and refine with a focus on UX.

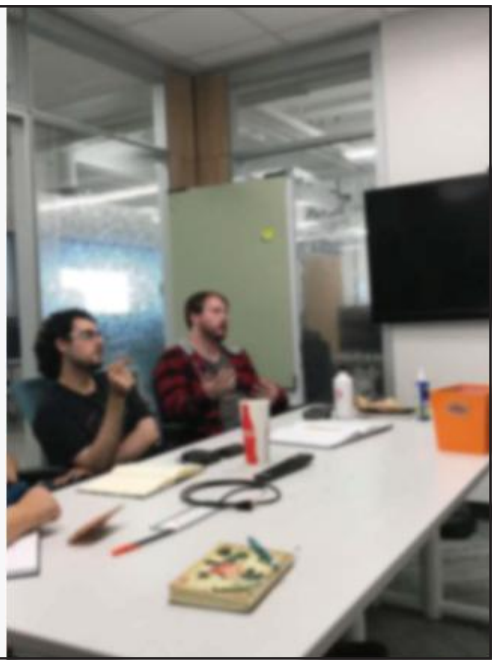
Technical:

- **Implement** player interaction.
- **Improve** noise level of ZedM camera.

Art:

- **Create** concept art and mockups.
- **Visualize** different player interactions.

7



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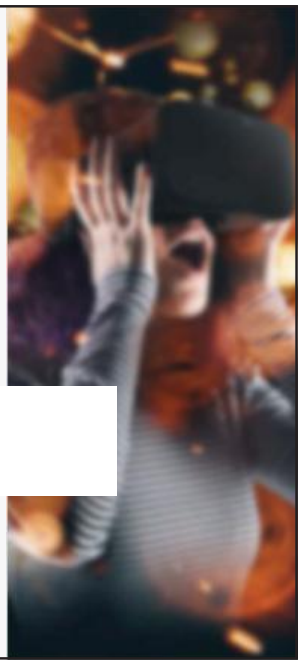

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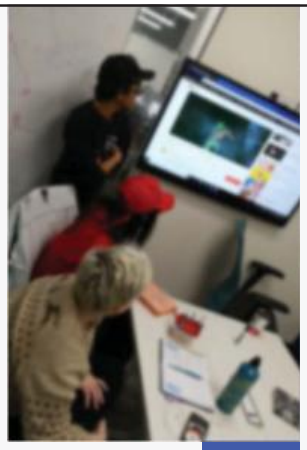

Since Last Time

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Settled on a game idea.

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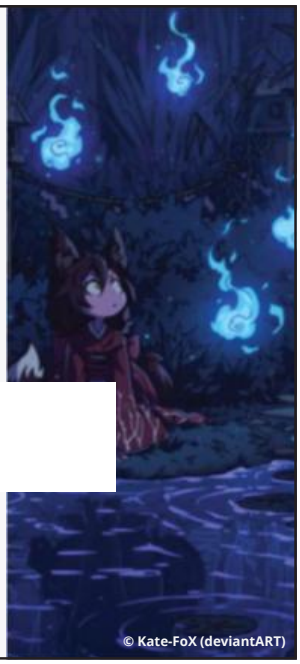
Game Premise

An interactive **sandbox** experience where you interact with **floating creatures** around you in **Mixed Reality**.



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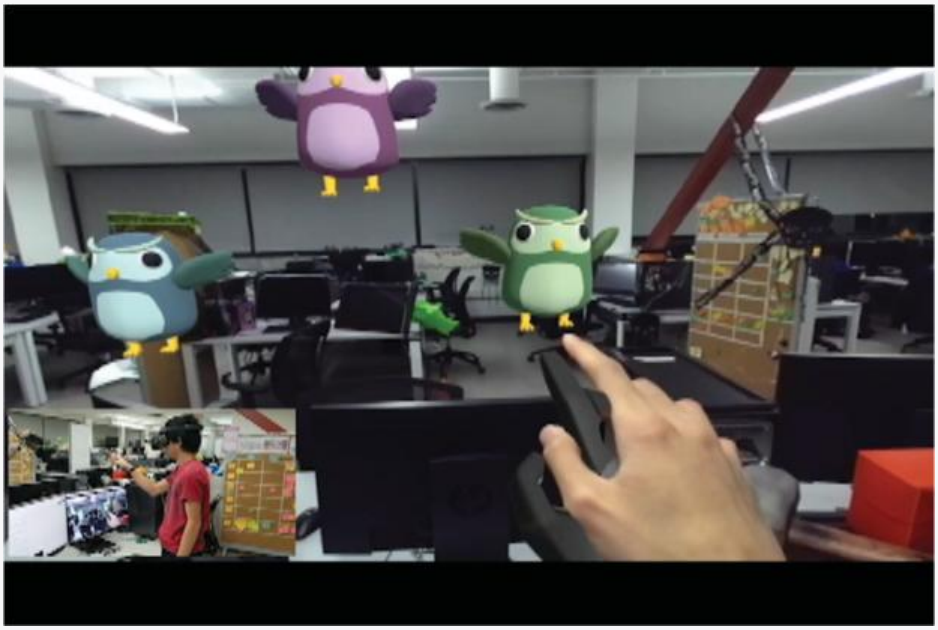


6

Sketches

Silhouettes

7

8

Next Steps

Design:

- **Continue** conducting external playtests.

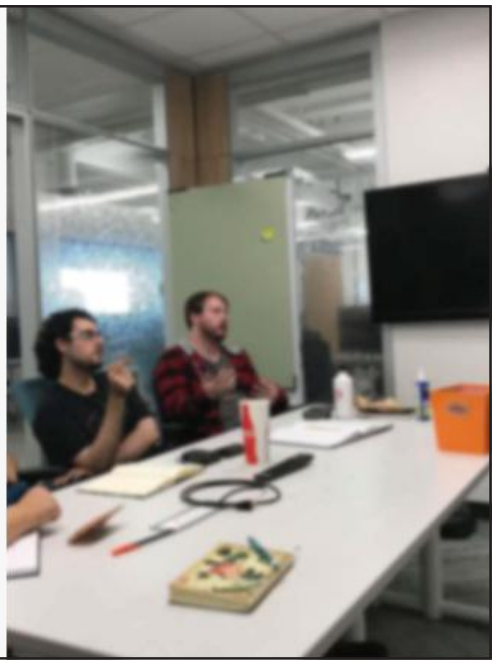
Technical:

- **Implement** player interaction.
- **Improve** noise level of ZedM camera.

Art:

- **Create** more concept art and mockups.
- **Visualize** different player interactions.

9



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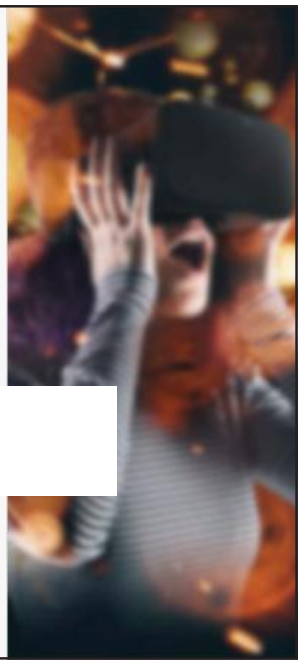

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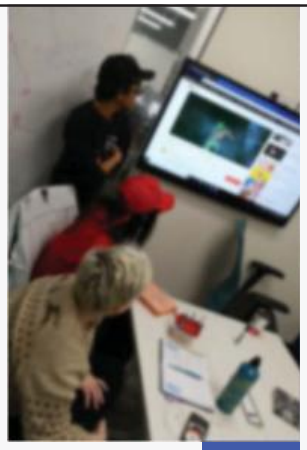


Since Last Time

Talked with Shadow Factory.

Creating concrete character designs.

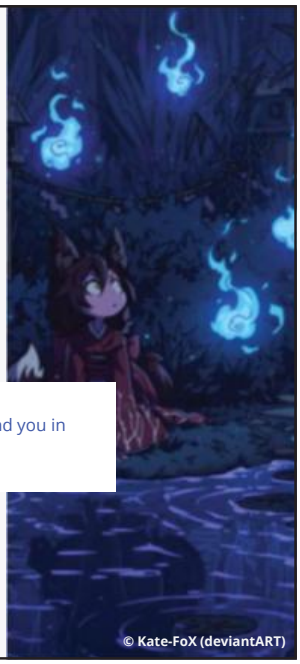
Playtested character designs and materials.

Implemented multiple mechanics.

4

Game Premise

An interactive **sandbox** experience where you interact with **floating creatures** around you in **Mixed Reality**.



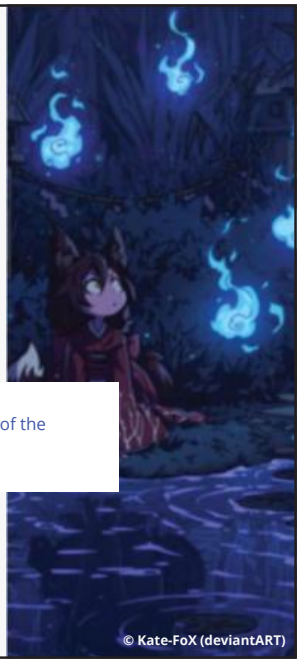
5

6

7

Character Design
Playtesting

We went around the school in crowded areas, and **asked** people what they **thought** of the **designs**, which ones they **liked**, and how they would **interact** with them.



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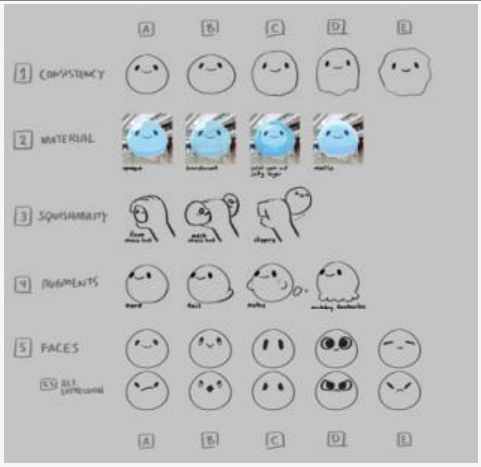
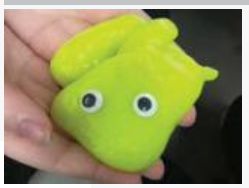




Our Results

- We tested **creature designs** and **physical materials**.
- Around **50 people** were interviewed.
- Most people preferred a more **dynamic** silhouette.
- Many participants liked a **simpler**, **generic** design than that with **specific** features.
- Most people preferred a **slime-like** or **putty-like** material than a **firmer** material.

Testing Plan

- **Continue** playtesting **art** prototypes.
  - See what **people like** and **how** they would **interact** with the creatures.
- **Think ahead** to playtest a **digital** prototype.
  - **Measure** factors including the length, amount and type of **interactions**.
  - The tester's overall **reactions**.

10

Next Steps

Continue playtesting designs and interactions.

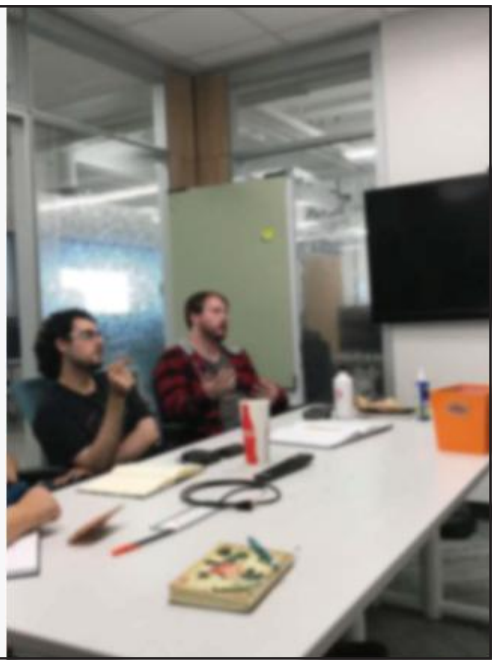
Decide on a solid design for our creature.

Work on grabbing, splitting and merging.

Create a list of sounds and audio.

Research shaders and materials.

11



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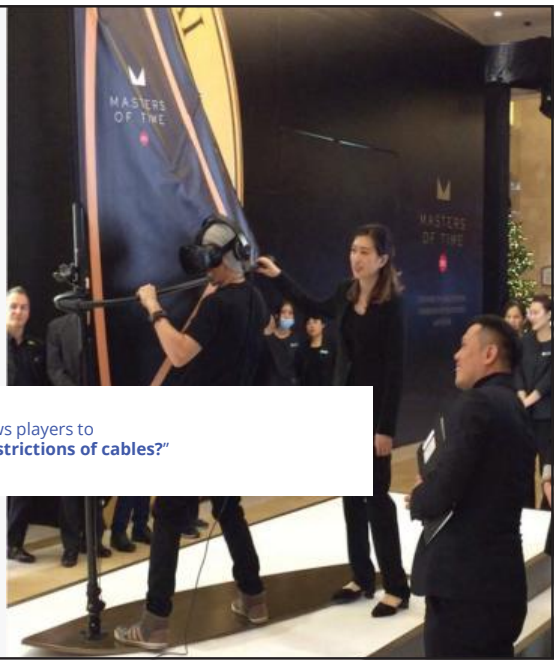

"What would be **cool** in terms of gameplay that allows players to **move around spaces and buildings** without the **restrictions of cables?**"

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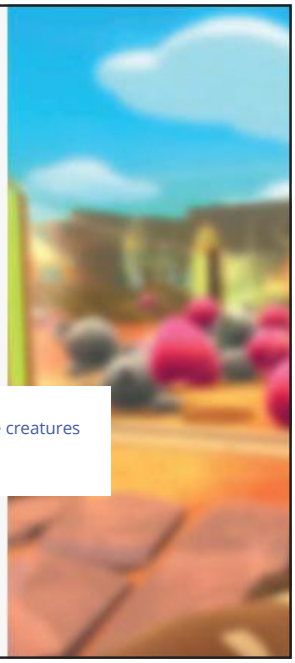
Project Premise

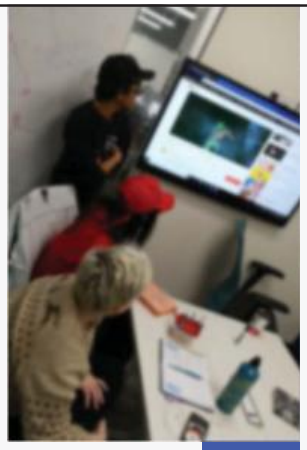


A **sandbox experience** where you **walk** around and use your **hands** to play with cute creatures that are floating around you in the **real world**.

4

Project Premise

5



Since Last Time

Talked with **Shadow Factory**.

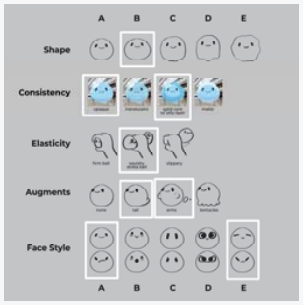
Continued to **playtest**.

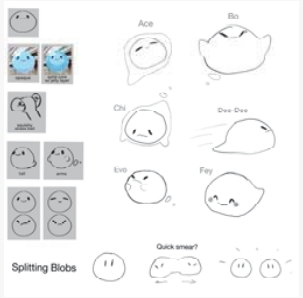
Cemented a **final creature design**.

Implemented **picking up** and **merging**.

6

Finalized Creature



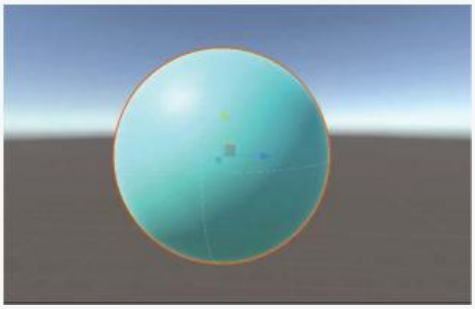


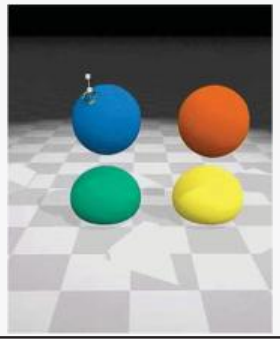
7

Faces and Behavior

- **Created** an A.I behavior chart.
  - Drew **facial expressions** based on the chart.
  - The creature **reacts** based on the actions you do to it
    - ex. picking up the creature will result in a surprised expression!

8

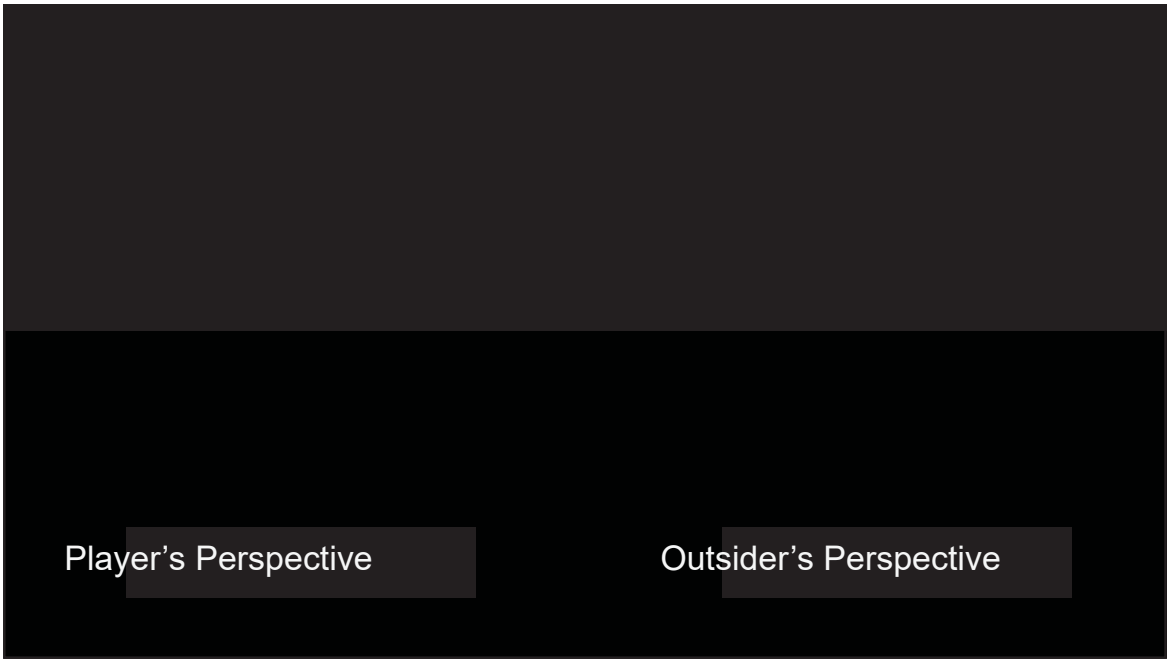




Shaders and Textures

- Played with **shaders** and **textures** to create a look we liked.
  - We're aiming for a texture in-between **silly putty** and **jelly**.
  - We wanted the creature to be **fun** to play with while also using **visual** and **audio cues** to replace the lack of haptic feedback.

9



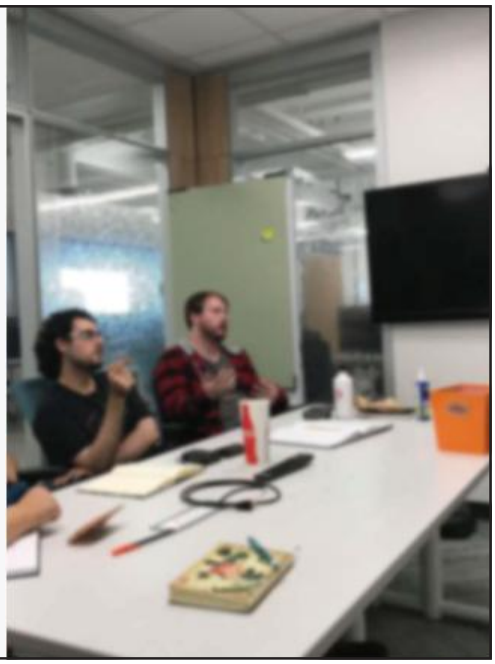
Next Steps

Continue **playtesting**.

Transfer the final mockup to a **3D model**.

Implement **faces** and **reactions** based on player's actions.

Create a list of **sounds** and **audio**.



11

Thank You

Hexabyte Games

Enhancing Reality

1

Part of Game Design GAME43796 at Sheridan College



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Project Manager
Narrative Designer

James Pratt
Design Lead

Michael Arcadi
Technical Lead

Justin Capcap
Technical Designer

Keana Almario
Art Lead

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Meet the Team

Design challenge by: SHADOW FACTORY

2

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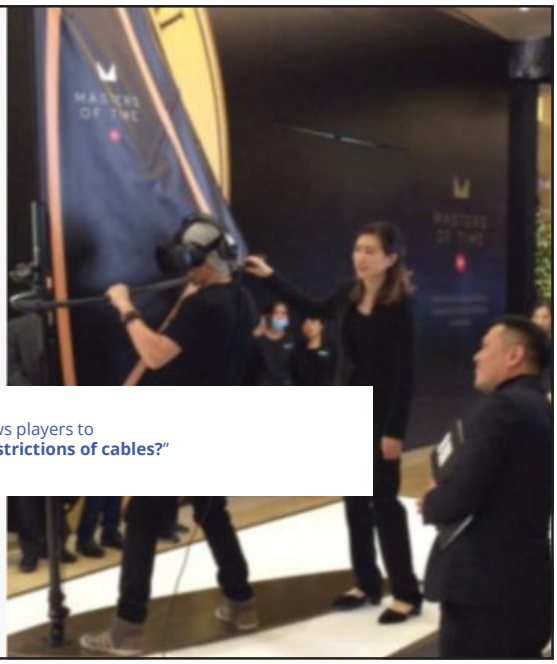

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Project Plan

We want to **enhance reality.**

We do this by creating amazing play experiences that blend the **virtual** world and **real** world.

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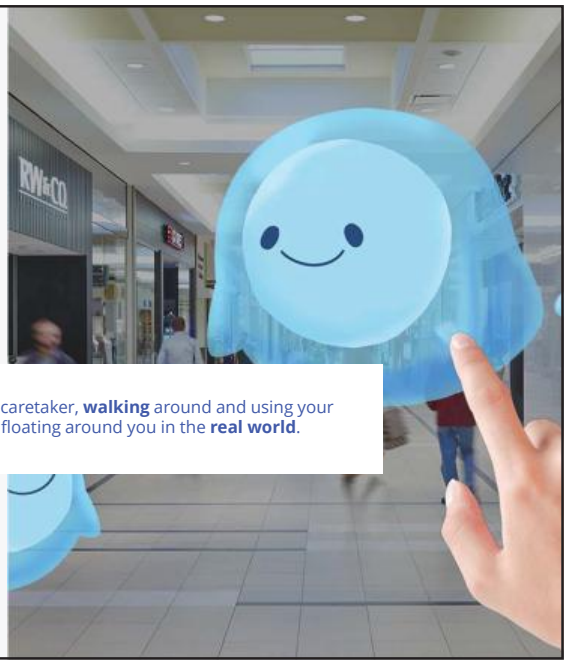
Project Premise



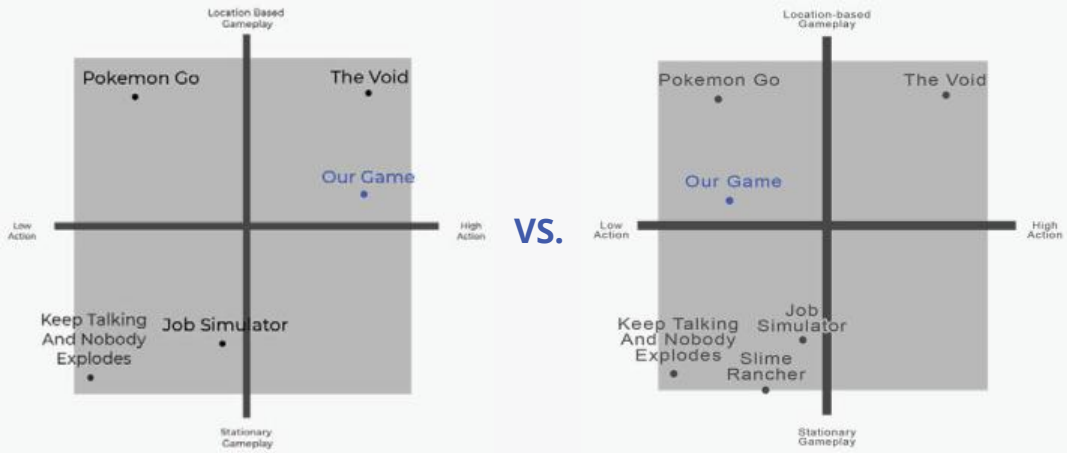
A **sandbox experience** where you are an assistant caretaker, **walking** around and using your **hands** to play and interact with cute blobs that are floating around you in the **real world**.

5

Player Perspective

Outside Perspective

Constellation Then and Now



7

Project Changes

Since we've submitted our project charter, we've:

- Shifted our priority to considering **UX first**.
- Prioritized **external playtesting** and **location variety**.

8

Decisions and Supporting Factors

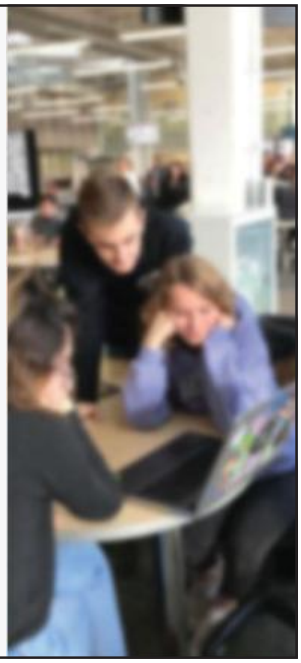
- Decided to **design** for **UX** instead of purely "fun-ness".
  - Keiran mentioned that **UX** is often thought of **last**, ex. people treating the VOID like a roller coaster
- Decided **not** to make our **goal** Level Up.
  - Level Up has a judging system that heavily favors **arcade multiplayer** games.

9

Design Testing & Results

Test **everything**, test **often**.

- We focused on **external** physical testing for various designs, mechanics and materials.
- Then, we used **surveys** to gather people's thoughts and opinions.
- As a result, the information helped inform our **design** decisions and **character** design.



10

Project Timeline

December	January	February	March	April
Alpha Build	Alpha Playtests		Beta Build	Beta Playtests / Project End
Basic player interactions	Other interactions & AI	Tech & animation improvements	External experience testing	Polish
In-game models & first pass animations	Reaction animations	External experience development	Game Beta	Reflection
Intro & tutorial storyboards	Implementation of calibration and tutorial	Public space playtest	Showcase preparations	
	Public space playtest			

11

Reflection

- **Designing** in uncharted territory needs a huge amount of time, research, and effort.
- **UX** is vital, especially if you're making a non-traditional game.
- **Team bonding** makes a difference.
- **Meeting people** broadens horizons, especially with design thinking.

12

Thank You

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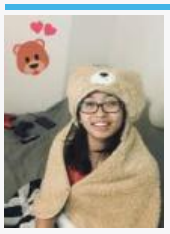

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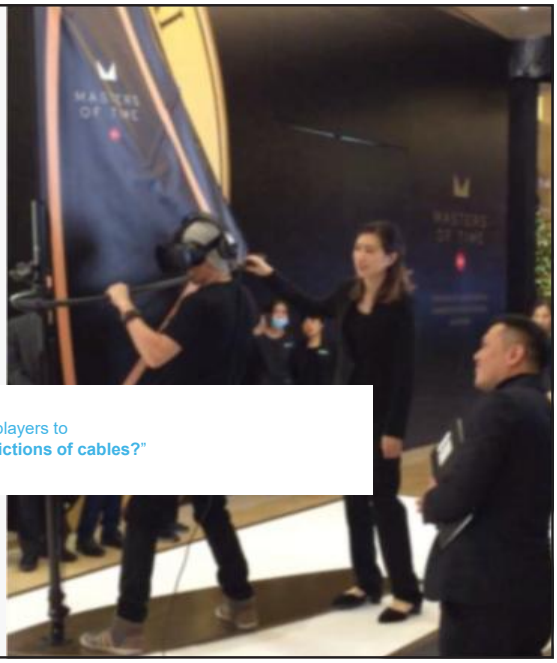

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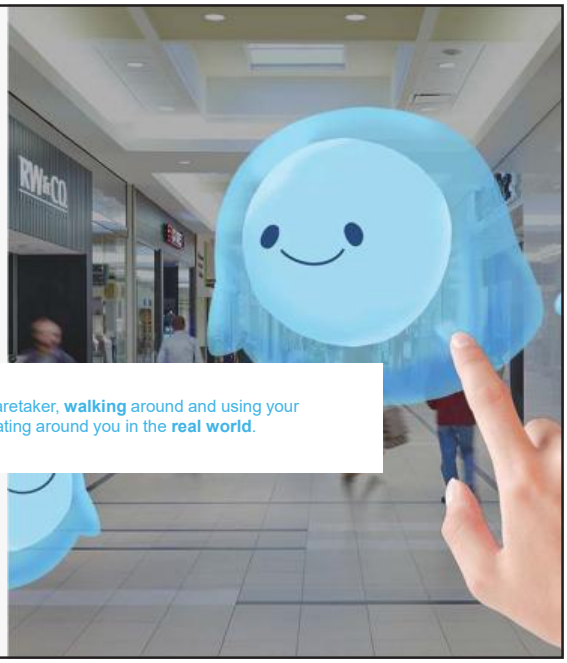

6

Project Updates

Since last semester:

- Reduced our scope
- Fixed some bugs that were present in the Alpha
- Began focusing more on polish and feel
- Started work on branding

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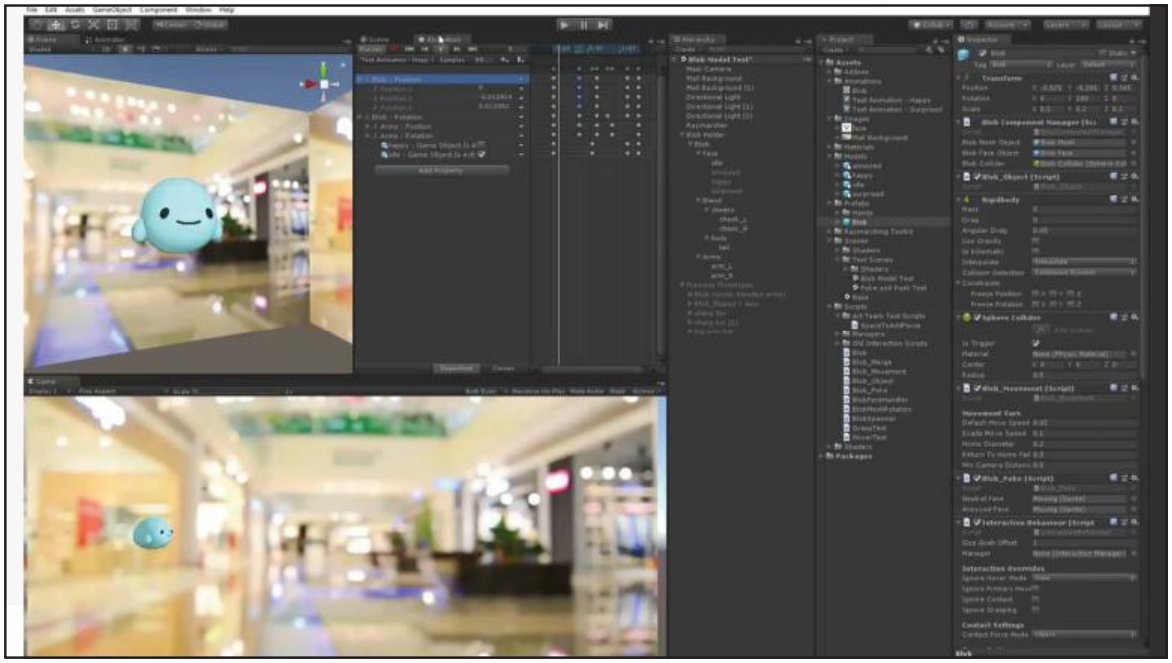

Playtest Report Template

- Objectives
- Metrics
- Pre-Test and Post-Test Surveys
- Moderator Script
- In-Game Observations
- Recommendations
- Conclusion

9

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Moving Forward

- Continue polishing with art, design, and audio
- Conduct playtesting sessions
- Complete framework of team website

10

Thank You

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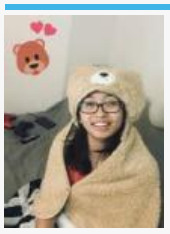

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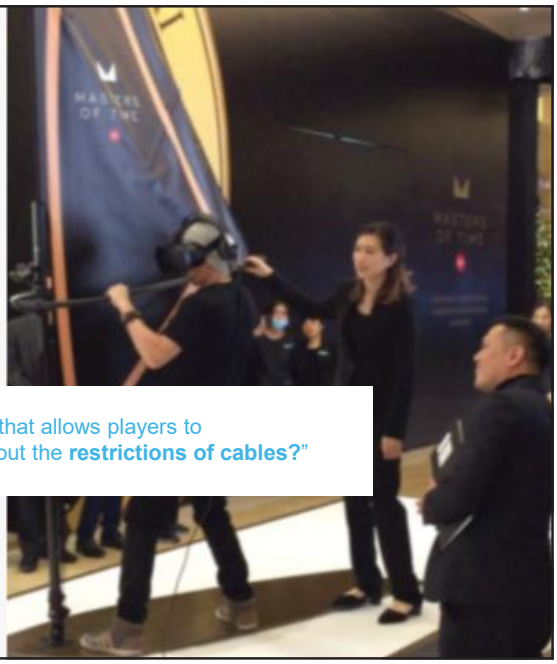

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Project Plan

Create an experience to be shown in **public places** like the mall, where the player can **walk around freely** and use their **hands to play** with virtual objects.

5

Booyositter

King Booyo has asked you – a new Booyositter – to take care of his little ones while he is away. Watch after and play with them until he gets back!

6

Project Updates

- Scope adjustment
- Bug fixing and troubleshooting
- Narrative
- Animations
- Technical report
- Branding & website

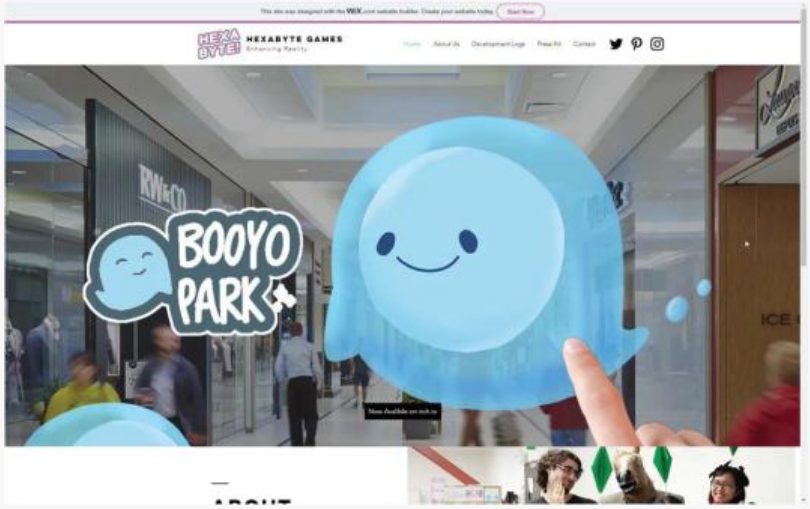
7

Technical Report

- Step-by-step setup for each piece of equipment
  - ZEDm Camera
  - Leap Motion
  - Windows Mixed Reality Headset
  - SteamVR
- Troubleshooting various bugs/crashes
- Packaging of the game

8

Team Website Framework



9

* Uses placeholder assets/text that will not be in the final website

Moving Forward

- Implementing narrative elements
- AI animation and programming
- Continue playtesting
- Continue bug fixes

10

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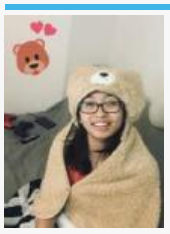

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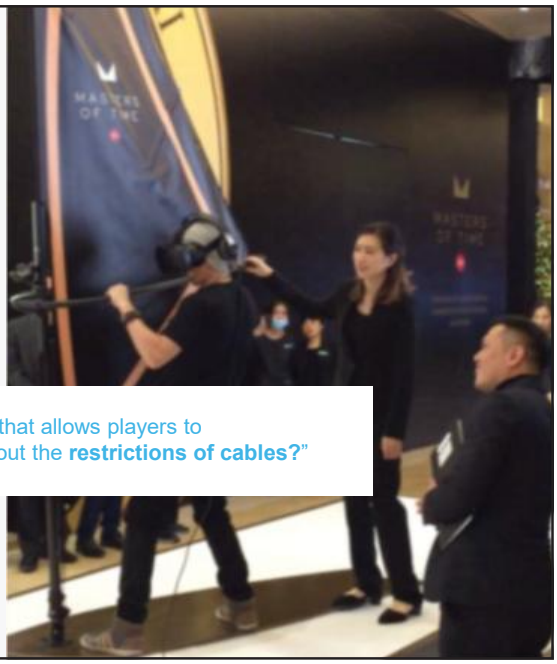

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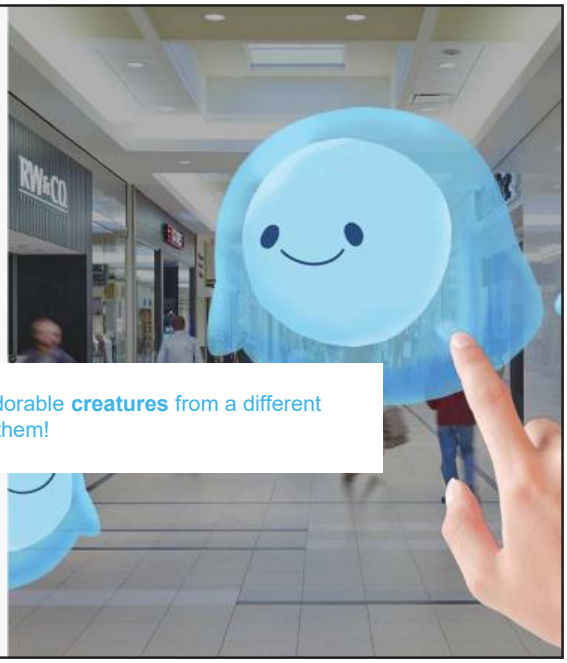

Welcome to **Booyo Park**! Play with the adorable **creatures** from a different plane of existence and **learn** more about them!

6

Project Updates

- Bug fixing and troubleshooting
- Narrative
- Animations
- Sheridan Playtest session
- Branding & website

7

First Playtest Objectives

- How well can players **gauge distance** of the Booyos
- How well do players **adjust** to using **Leap Motion** hands
- User **progression**
  - Changes in **emotion**
  - Changes in **behaviour**
  - Changes in **engagement**

8

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First Playtest Metrics

- Rate of **Error**: How often do players fail to hold Booyos?
- **Completion** Rate: How often to players hold or merge Booyos? Do they need **instruction**?
- Task **Time**: how **long** it takes for the player to use the **Leap Motion** hands?

9

Moving Forward

- Implementing **narrative** elements
- AI **animation** and **programming**
- Continue **playtesting**
- Continue **bug fixes**

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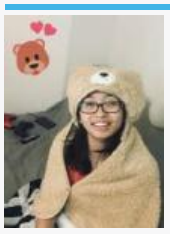

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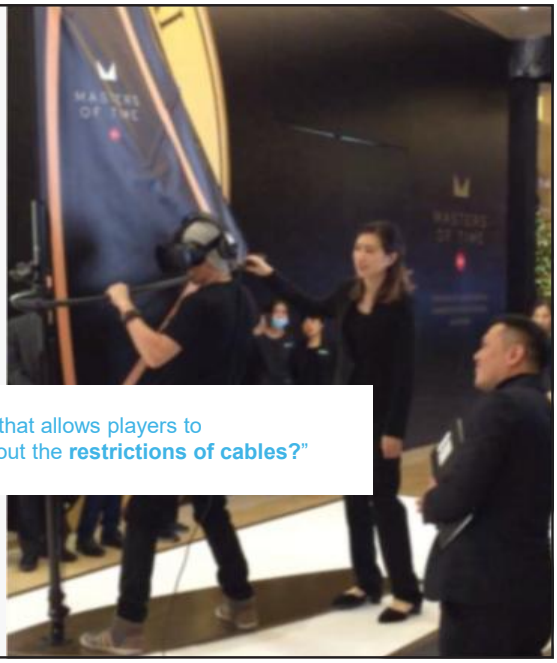

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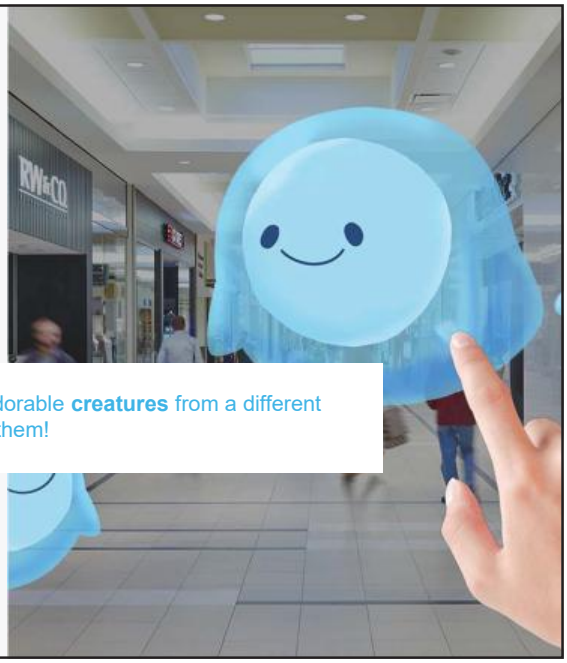

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voodoo

First Playtest Results

- Tested with **two** 4th year Animation students
- **Determined** that players could tell how far the Booyos were from them
- Users quickly became comfortable with using their **hands** as controllers
- **Spawning** problems mean creatures appear in **unreachable** places like near the ceiling
- Need to create a clear **time limit** for users

10

Moving Forward

- Implementing **narrative** elements
- AI **animation** and **programming**
- Continue **playtesting**
- Continue **bug fixes**

11

Thank You