Botanic Gardens AR

An adventure into Botanic Gardens AR world.

Project done by: Grace Foo,
Bhoomika Manot, Danette Oh,
Kesler, Adrian

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Introduction

Project description

Botanic Gardens AR is an mobile AR game based on Botanic Gardens Singapore. We aim to bring an educational and unique approach to educating users about the flora and fauna, and history of the Gardens. This uses multiple interactions, which unlocks a secret area when completed. The interactions start from the virtual 3D map, tapping on small plants to see clues, playing through hedge mazes and learning how to keep the environment clean and safe for all.

Background

Established in 1859, the Singapore Botanic Gardens is a green haven in the busy city-state. Originally founded during the British colonial period, the gardens served as a hub for experimenting with agriculture. Over time, it transformed into a recreational haven, gaining global acclaim for its diverse plant collections, notably the renowned National Orchid Garden. The site holds historical significance as the birthplace of rubber tree cultivation, pivotal in transforming the worldwide rubber industry. Designated a UNESCO World Heritage Site in 2015, the Singapore Botanic Gardens continues to captivate visitors with its lush surroundings, diverse plant life, and storied botanical heritage. (UNESCO, 2015)

Based on this history, we want people to learn on this important site in Singapore and to appreciate its features and its nature, through making an AR app

Core objectives

- To teach players more about the history of botanic garden and nature through a fun experience
- To teach players more about nature
- To motivate players to visit botanic gardens in Singapore

Target Audience/platform

- Nature lovers
- Tourists who want to learn more about the gardens in Singapore
- Users that wish to try a unique and educational AR experience
- Teenagers and young adults
- The Disabled who are unable to visit the park due to inconveniences

Our target platform are Android phones owners, since "estimated 7.33 billion smartphone users worldwide in 2023, 49.11%, or 3.6 billion, are expected to be Android smartphone users." (Turner, 2023). It will also be implemented on Apple devices, to make the game more accessible to players.

Competitive Analysis

Magical forest

Magical Forest is an AR game developed by Designium, which uses 8th wall to develop WebAr content compatible with mobile phones. The player will play as a dwarf living in a magic book and must complete looking for insects that escaped into the forest. The plants, grass and bugs spawn on the "real world".

https://www.8thwall.com/designium/magical-forest

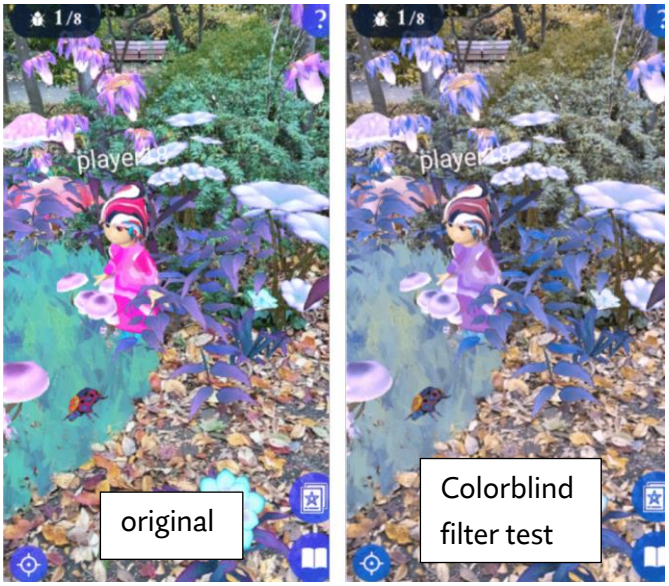
Advantages

UI

The UI on screen is easy to recognize and to understand roughly what they do with the logos. There is also a "?" button which is helpful for those unfamiliar with how to use AR, so they can rely on it when lost.

The UI also is visually appealing and matches well with the theme of the game, matching the "magical" theme of the game, due to usage of purple, as purple represents "magic" (Color Column: Violet, n.d.).

Additionally, the UI is also inclusive for those who are color blind. The buttons are easy to see and read despite having the disability. The results of which can be seen in the picture underneath, testing for red, green color blindness since the "most common type of color vision deficiency makes it hard to tell the difference between red and green." (National Eye Institute, n.d.).



Spawning of the plants

The plants spawn quite nicely and accurately on real-life terrain. The plants and mushrooms are also very visually appealing.

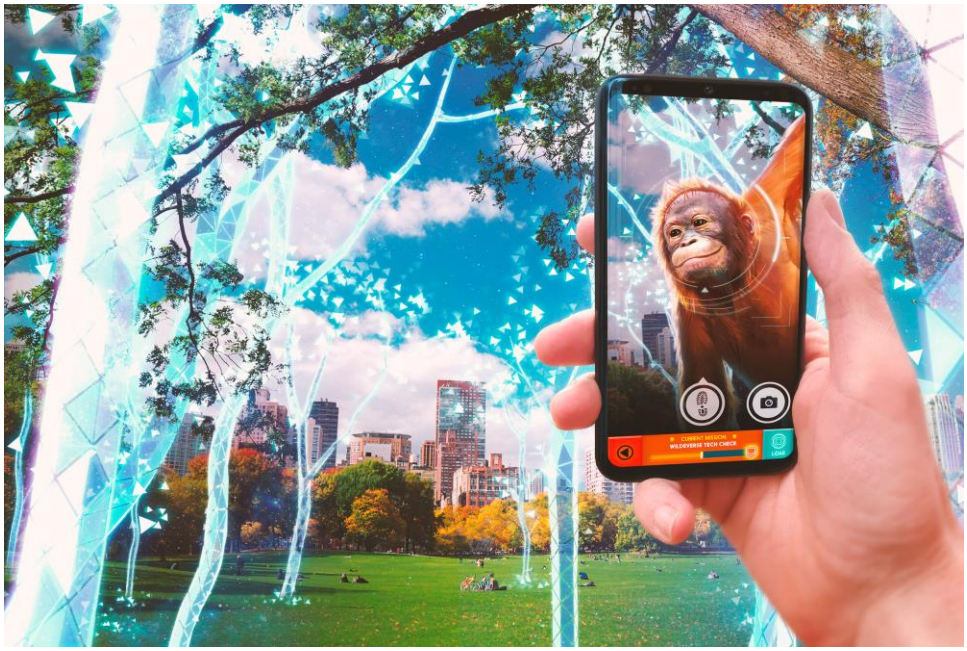
Disadvantages

Usage of AI

The project used AI for the textures, this is found in an article looking over this project stating". The patterns for Kobbito costume and insects are generated using **Midjourney** as textures for the 3D models." (Chin, 2023). Because of the usage of AI and no human touch, some of the visuals look unappealing, don't fit well with the model the texture is placed on, or look scary, especially for those who have trypophobia. Resulting in not being inclusive to users with trypophobia.

Wildeverse

Wildeverse is an AR game developed by Kenyan AR Developer, Internet of Elephants in collaboration with conservation science experts from Borneo Nature Foundation, Goualougo Triangle Ape Foundation, Zoo Atlanta and Chester Zoo. This game was intended to play outdoors, but due to the release during the Covid-19 period, the game has been updated to adapt to smaller boundaries to play at home. Wildverse creates a virtual forest that players explore to find animals.

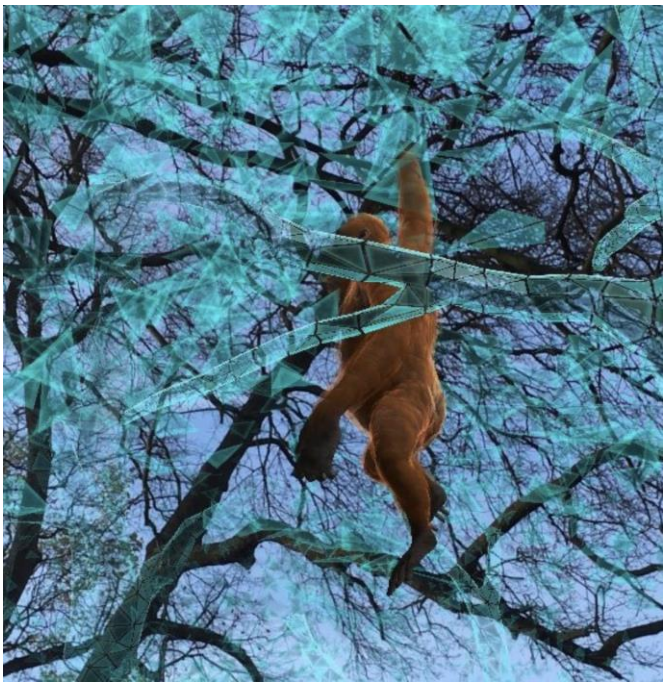


(Wildeverse, n.d.)

Advantages

Models

The models developed that represent the apes are well developed and look realistic due to the texturing. This enhances the user experience as it gives a more realistic gaming experience. Additionally, as intended for original use, the player is to play outside, hence allowing users to integrate with their surroundings, ensuring safety of users.



UI

The UI shown in the game is simple to users, which allows users to easily play the game. Additionally, the icons are universally used, resulting in better accessibility for users. Furthermore, the game uses different tones of green to differentiate the land area. Additionally, green is the best color for red, green colorblind, as shown in the previous competitive analysis, making it inclusive for those with viewing disabilities. The game also uses dyslexia friendly fonts.

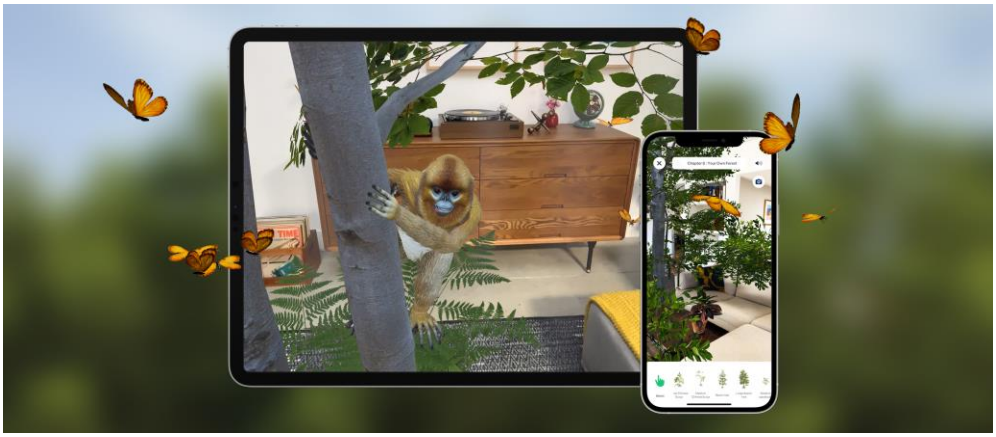
Disadvantages

Game is not available

The game has been taken off the App Store/Google Play Store due to tech being discontinued. Additionally, the game does not have much playing content, which can easily bore the customers. The game requires players to do things like collecting food traces and poop, which may not be interesting to the consumer demographic.

WWF Forests

WWF Forests is an AR app that takes the experience of exploring the forest into your homes, using their mobile phones. WWF has worked with Assemblr to produce this app. (WWF, n.d.)



Advantages

Realistic models

The models and environments look realistic, enhancing the players experience, making them feel more immersed

UI is simple and nice

The UI is simple, minimalistic and clear to see and understand that they do, not cluttering up the screen

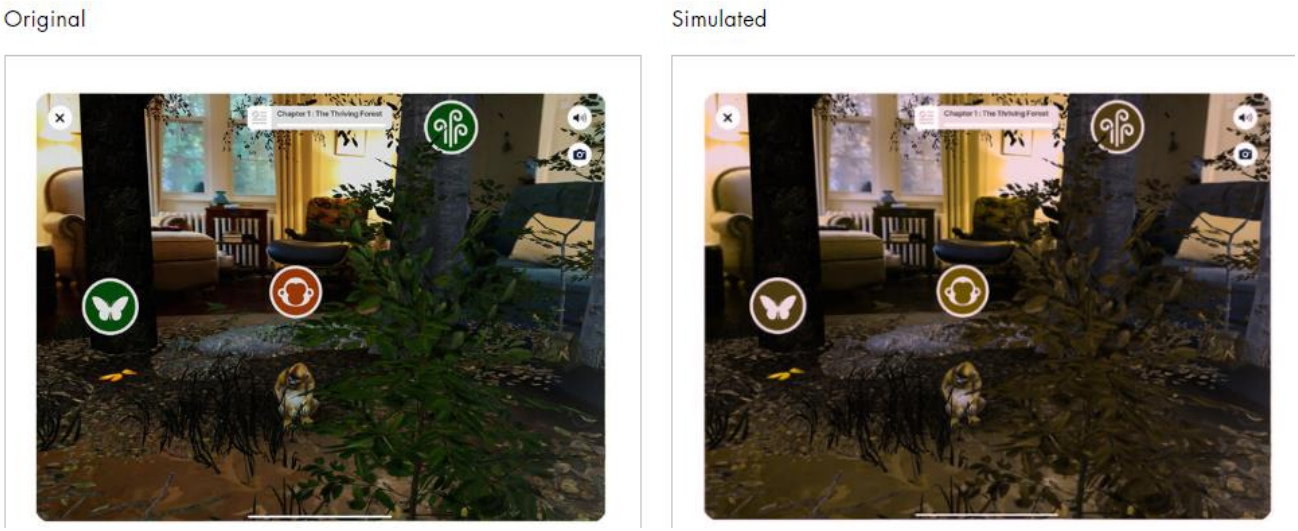
Disadvantages

Only available on apple devices

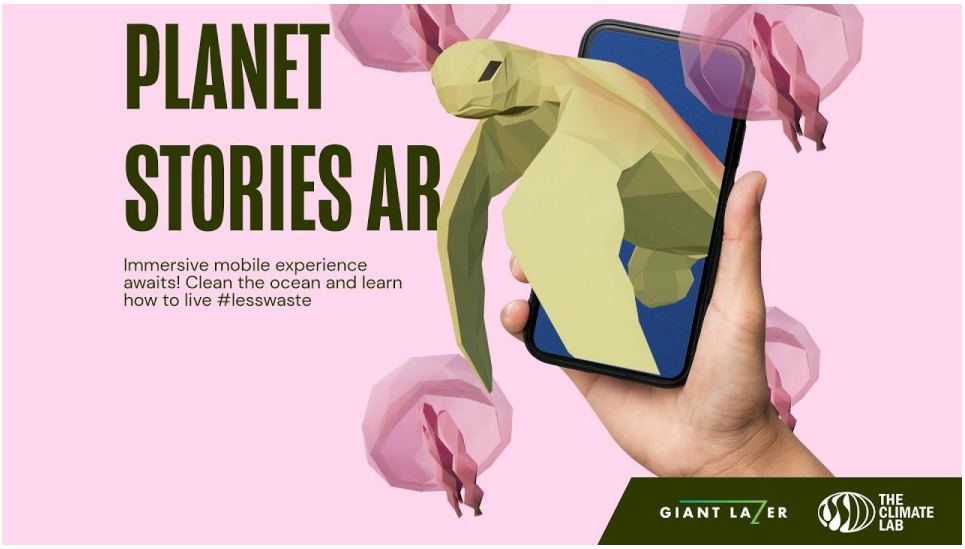
It is only available on apple phones/ on the apple play store, restricting the amount of people able to play this app

UI tends not be good for those who are color blind

The color usage of the UI tends to mix red and green in the same areas which is not a good thing



Planet Stories AR

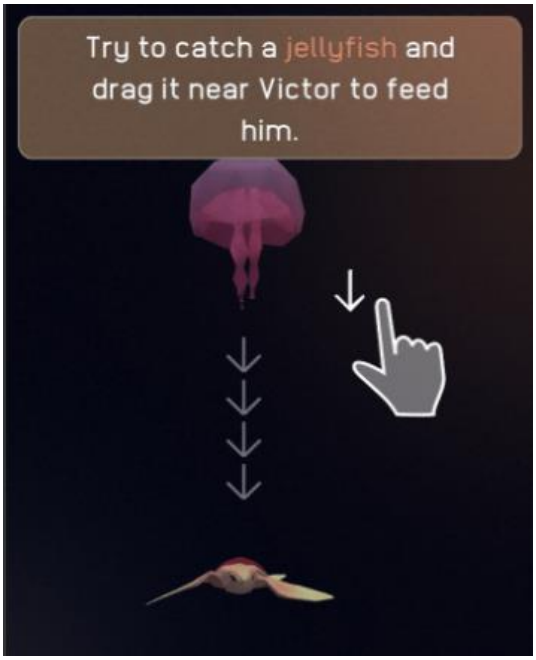


https://giantlazer.com/planet-stories-ar-game/

An AR experience app made by a company that makes AR/VR games called Giant Lazer and at is available on mobile devices. The app aims to spread awareness of how animals are harmed by pollution and the app does so by implementing minigames with AR elements that shows why animals are harmed by pollution as well as giving the user lifestyle advice about what they can do to reduce pollution. (GiantLazer, n.d.)

Advantages

Simple and satisfying gameplay



The in-game minigames involve simple interactions like dragging and dropping as well as tapping button options. The simplicity of the game allows the message to be clearer as the user would not be too concerned with the gameplay. In addition, the sound effects, voice acting and the mini animations that play when doing the interactions make the game more appealing.

In game completion rewards

The game rewards players within game badges if they manage to complete the challenges within certain time frames. This makes the game more fun for players that like to challenge themselves with the gameplay aspect.

Disadvantages

Unfinished implementation of AR elements

Despite being advertised as an AR game, there is quite limited AR elements in the game. There are a few interactions involving AR elements with one just being a photo taking filter. I could tell that the gameplay should have had AR elements, but it does not display properly on my device.

Gameplay data resets

The data of you game run does not save so if the player exits the application, the current game data disappears. The game, however, does save the player's highscore.

Table of Summary of our findings

Product	Quick summary	Advantages	Disadvantages
Magical Forest	An AR game where the main character explores a forest area and collects bugs	• UI is easy to read and understand and helpful • UI is easy to read for those with Color blindness • Spawning of the plants accurate	• Usage of AI to make textures, makes some of the models look bad
Wildeverse	An AR game that allows players to learn more about how to conserve the forests and native animals.	• Realistic models, enhancing player experience • Able to integrate into real world, ensuring player safety • User inclusive UI with logos, disability friendly colors and fonts	• Not available online due to discontinued tech • Game might not be fun to play due to unappealing tasks
WWF forest	An AR game that allows players to spawn a AR forest within their homes	• Models are realistic and makes it more immersive • UI is simple to understand and not cluttering	• Only available to apple devices • Sometimes not color blind friendly
Planet Stories AR	Educational AR game that teaches players the negative effects of pollution.	• Gameplay is simple to focus on the educational aspect . • Satisfying interactions that make gameplay	• Game data does not save each session which means progress will be lost . • AR elements seemingly not

		more. appealing • In game achievements make makes it more satisfying for players that do the minigames well.	implemented very well.

Persona

My personal and usability tester is Shao Min. She is 18 years old and a NAFA student. She loves playing games, she loves nature and animals, and is usually interested in new things such as AR. However, she is green, red color blind, and sometimes can't play certain games due to them not being inclusive of her disability, for example, being unable to see certain graphics or make it difficult to see things, making her experience with those games not great.

She also fits our target audience since she is a nature lover, and wants to try a new unique game experience, especially since she has never tried AR before and is interested in new technology and games. Additionally, we could learn a lot from her input regarding her color blindness, to make it more inclusive, for those who also are color blind.

Shao Min

Age: 18

Job: Nafa Art student

Personal Traits

Patience ▼65%

Flexibility ▼70%

Problem-solving ▼75%

Bio

Shao Min is an 18 year old Nafa student, who loves playing games, loves nature and animals and is interested in new tech, like AR. However she has green red color blindness

Frustrations

- Struggles with games due to not being inclusive for those with color blindess
- Due to being busy with school, she has little time to go to parks/gardens

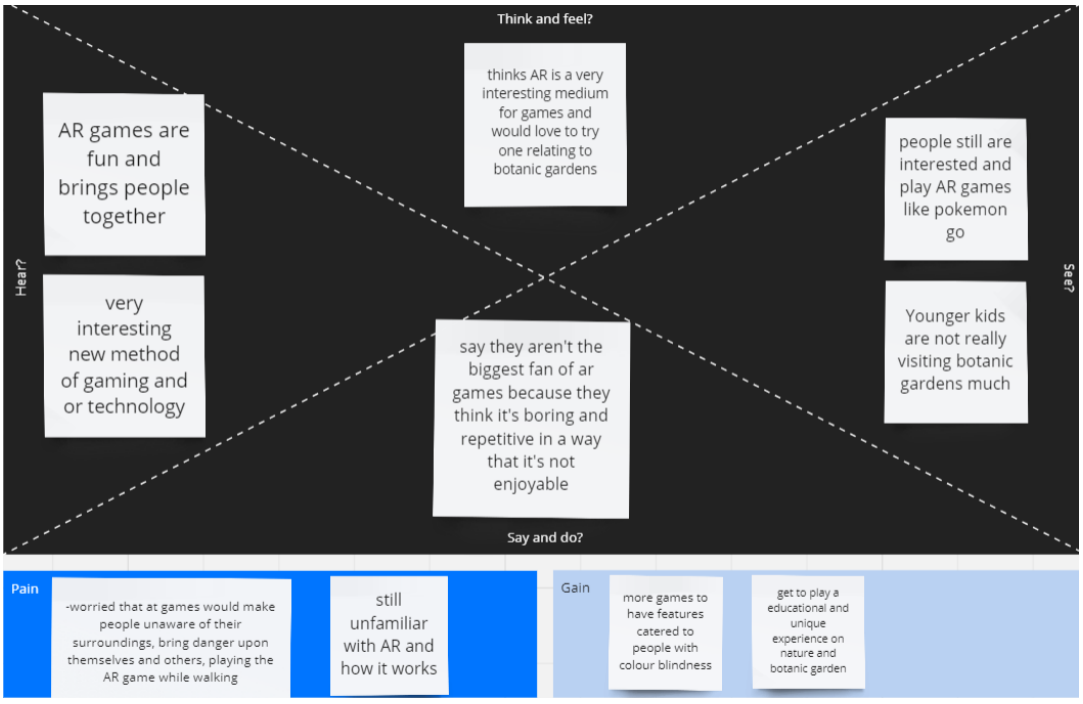
Needs

- Would love a AR game related to gardens or parks that is inclusive to her color blindness that is fun and slightly educational

Free Time

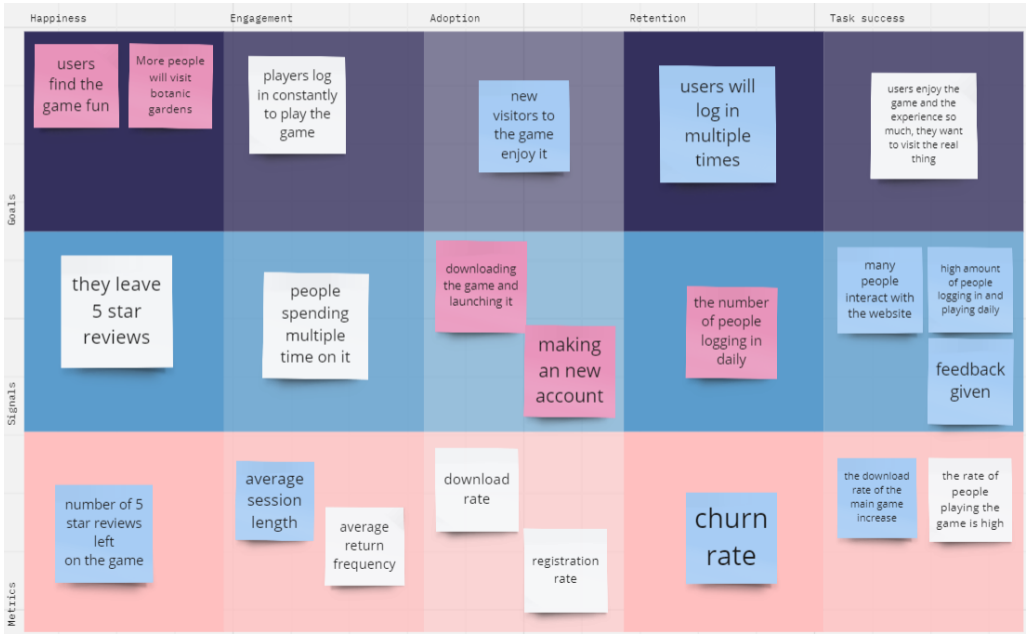
- Plays games especially those based on animals or nature
- Likes to look up into new things
- Goes to parks or gardens

Empathy Map

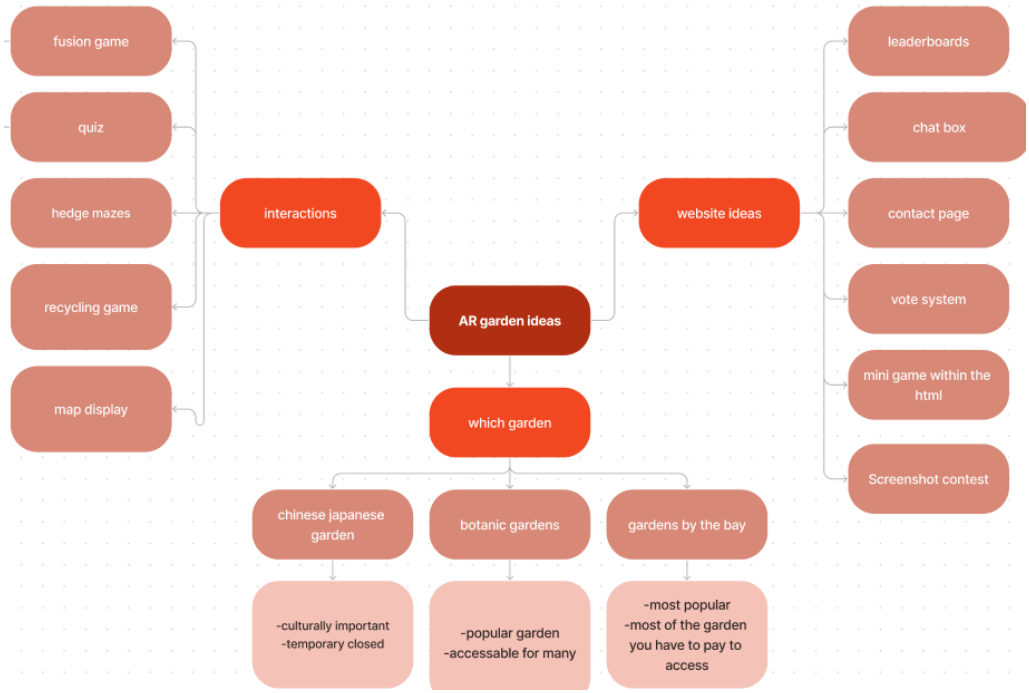


Day in a life of

Heart Map



Mind Map



Game Design Segment

Game Overview

Players first register and or log in, and they will be sent into the main menu scene, where they can either start playing the game, adjust audio, take a picture competition, check our website, and can log out.

When starting the game, the player will be introduced to Botanic Gardens and how the game will work and the different image targets, and that they can unlock the greenhouse when finishing all 4 areas.

They can scan through each of the images to play interactions for each area, such as the fusion area, the recycling area, maze and the quiz.

Once playing through all of them, they will be notified that they can scan and play the greenhouse area. Once done visiting the area they van go back to the main menu and log out

Platform Minimum Requirements

The game will only be available for Android mobile phones, using android version 10.0 (API level 29)

Synopsis

The player will explore an AR version of Botanic Gardens, scanning images to visit different areas of Botanic Gardens and once finishing each area, they can be given access to visit the Greenhouse.

Game rules

Players must complete all games successfully to gain special access to the secret area, the greenhouse.

General rules

Each area can only be visited through scanning each image. The greenhouse can only be accessed when finishing each area. For the website, to enter the picture contest, they must submit photos.

Interaction rules

For the quiz, the rules is that you need to drag your stick to the correct model, if you answer it correctly your environment will have more items

For the Island, the player can drag the slider to scale the island and view the landmarks more closely. The player can also click on a button to play a small animation of the clouds bouncing. Lastly, players can also enable and disable the music by clicking on the music button.

For the fusion game, the player must drag the gazebo parts that the player spawns using a ground plane to the designated grey, "missing" areas of the gazebo model that is spawned using an image plane. After that, the player can decorate and take an AR picture of the finished gazebo.

For the maze game, Player will have to press start upon entering the interaction and a countdown timer of 100 seconds will start. They will have to scan the first maze image target to start and complete the maze by tilting their device/image target. As the ball hits the end point of the maze, they will be allowed to scan the second maze image target, complete it and start the third and final maze. Upon completion of exiting the third maze, they will be shown their score. If they are unable to finish the maze within the time limit, they will be given chances to restart and try again!

For Collect, the Player will go through a set of education UIs that teach the User about Singapore's cleanliness. In the final panel, the User must click "Start" to start the timer and prefabs of rubbish. must tap on the prefabs to collect the prefabs. After 10s, the timer reaches 0s. The 'end' panel is set to active to move on to the next game.

For Recycle, the Player will go through a set of education UIs that teach the User about Singapore's cleanliness. In the final panel, the User must click "Start" to start the timer. A 20s timer begins. The player must tap on the box to spawn the recyclables. Players must tap on the recyclable to activate it before dragging it to the correct box. A "wrong sound" audio will play if dragged to the wrong box "wrong sound" audio will play. After 20 seconds, the end panel is set to active for the player to scan the next image target.

Game Structure

Each image target unlocks an area, like a level. There is a secret level where once you finish all 4 areas you can visit the greenhouse area/level

Island (Map_ – Beginning of the game, shows iconic landmarks that represent different parts of the games

Gazebo - a fusion like level, where you fuse models together like a puzzle, when done you can decorate it

Maze - A maze level, where you complete the puzzle game to finish all three maze stages.

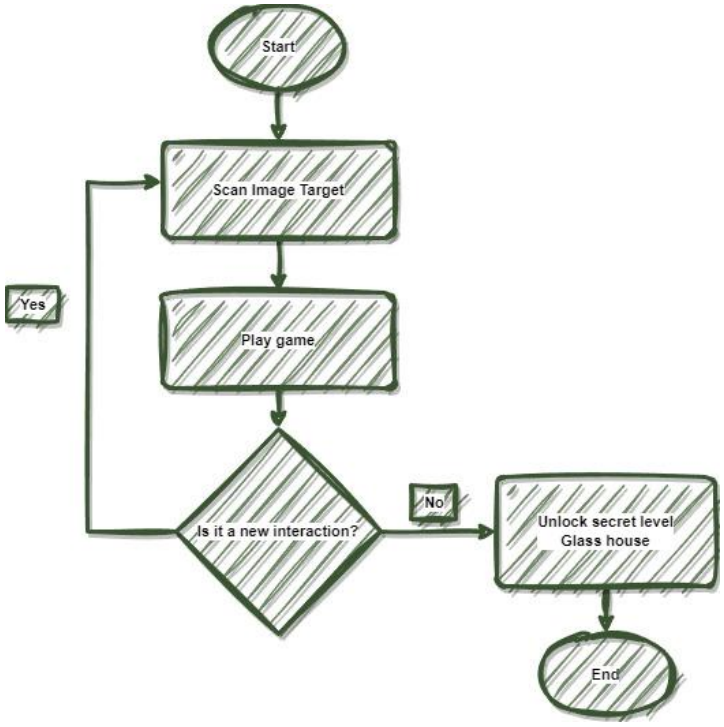
Learning forest - A quiz like level, where you need to drag the stick to pick your correct answers

Collect - A time-based game, where you need to tap to collect items

Recycle - A time-based game, where you sort the items into the correct bins.

Greenhouse - You can walk around and admire the greenery and nature of the greenhouse

Core gameplay loop



Game controls

To access different areas, players must show different images to see the area

For the quiz game, they need to tap the screen to spawn the next set of models. They have to drag the learning stick to the model they think is the correct option.

For the fusion game, the player must spawn the gazebo using an image target and gazebo parts with the UI display.

For the maze game, player must tap the start button and tilt their device to move the ball to the end point of each three mazes

For Collect, the player must tap on all the items in 10s to collect the items.

For Recycle, the player must tap on the box to spawn the items. To select the item, the player must tap on the item and then drag it to the correct bin.

For the greenhouse, to move the camera use your left finger and move your finger left to right on the left side

To move the player, move your right finger in any direction on the right side of your screen

Player

The player is visiting an AR version of Botanic Gardens, where they can visit the four areas by using image targets to visit play the mini game. They can later experience the hidden area, which is the greenhouse. It will be unlocked only upon successfully completing all 4 of the mini games.

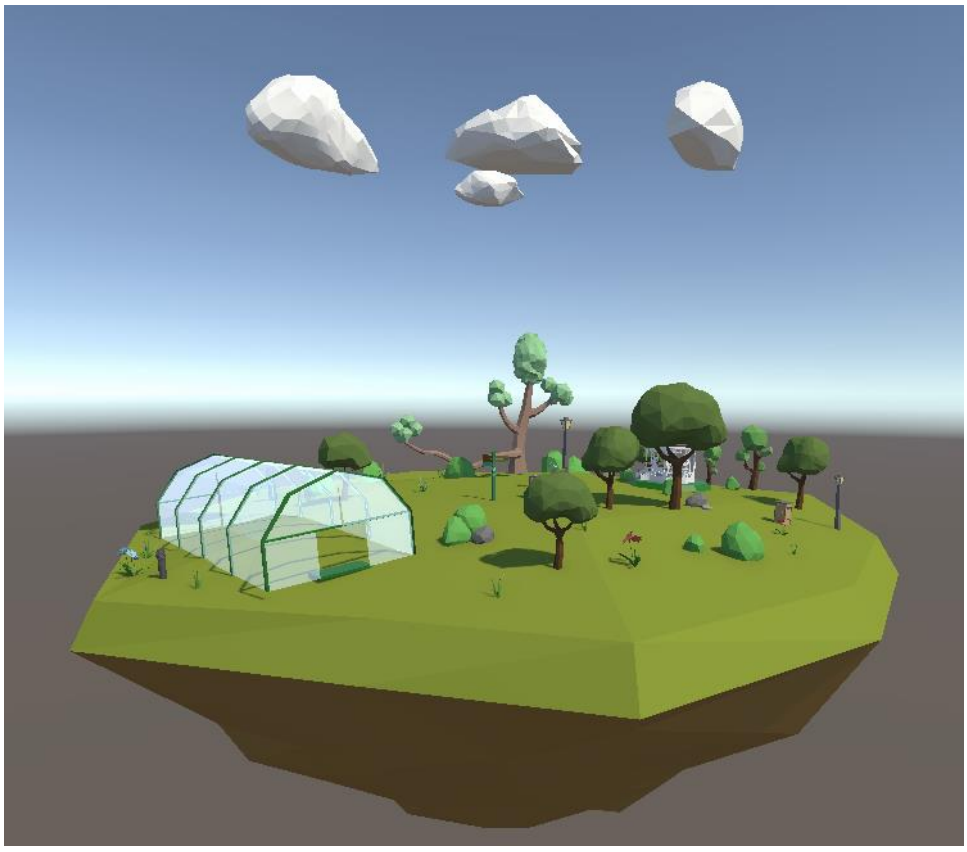
Level design and setting

The setting of our game is based off botanic gardens. Each "area" of botanic gardens can be accessed through images. There will be multiple models of environment surrounding the target area to increase the immersive feel of it being an area.

All the image targets can be found here:
https://drive.google.com/drive/folders/1GYojaZ5wS_4VjXRUvULaEUxTPQj1rIJo?usp=sharing

Island Map

The Island Map shows a brief overview of the different parts of the game which are represented by iconic landmarks that can be found in Singapore's Botanic Gardens.



The map has several forms of interactions:

1. Music Button

2. Animation Button (Clouds)

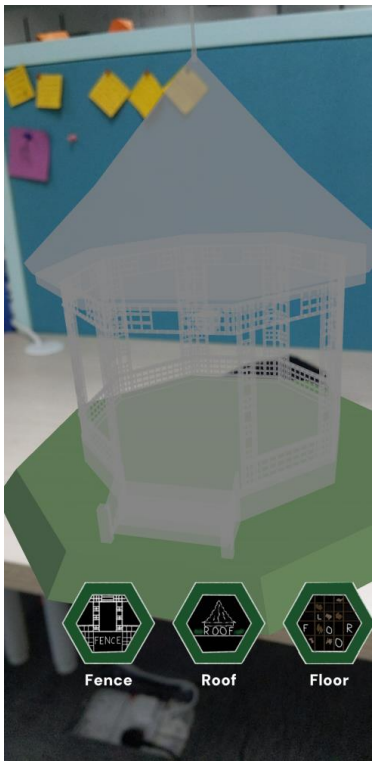
3. Slider to scale the island

Image used to scan:

Fusion

Fusion involves piecing together a representation of the real-life Botanic Gardens Bandstand.

The puzzle begins like this after scanning the image:



The player can press and scroll through the buttons and can start placing the respective pieces using the ground plane and can drag them to the greyed area to finish building the gazebo. The finished gazebo should look like this.

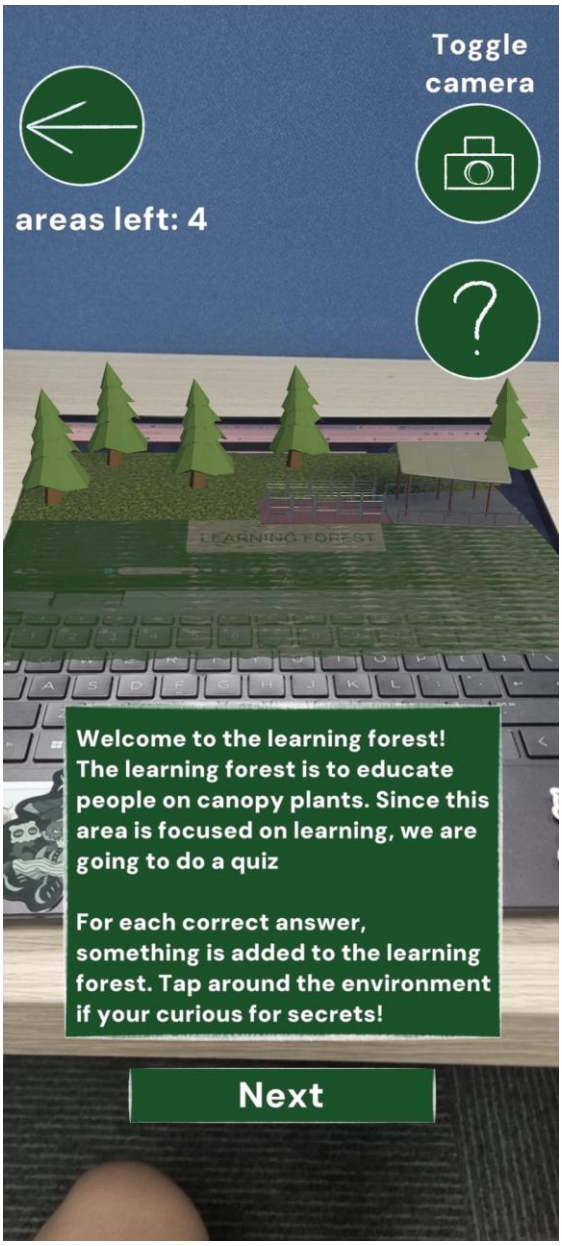
The player can then decorate the finished house.

Image target for the minigame.

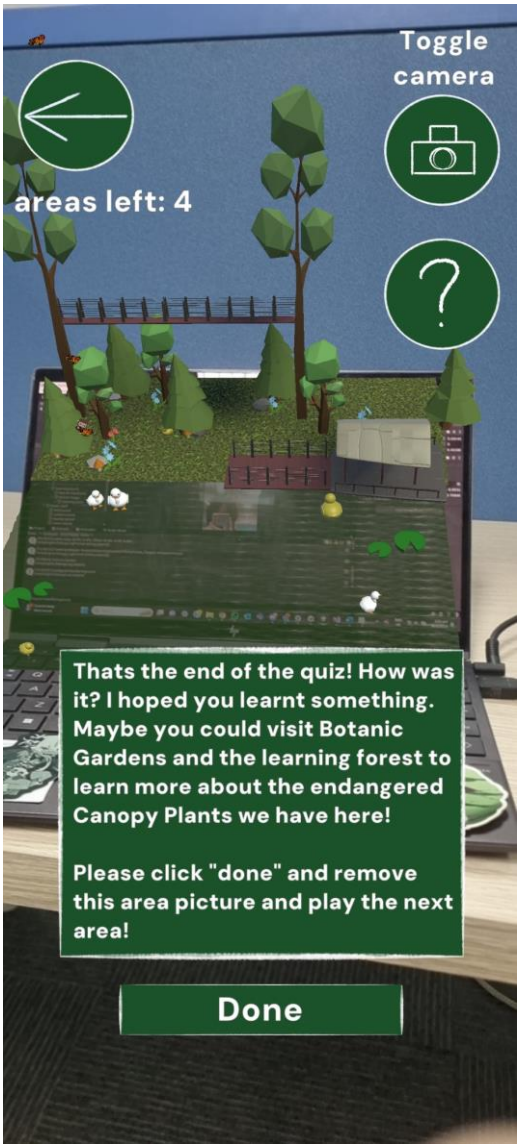
Quiz

The quiz takes place at the learning forest, inspired by the real learning forest at Botanic Gardens, since the quiz promotes learning

The area looks like this:



When answering questions right, new things will spawn in the scene, if answering all correct, it will look like this:



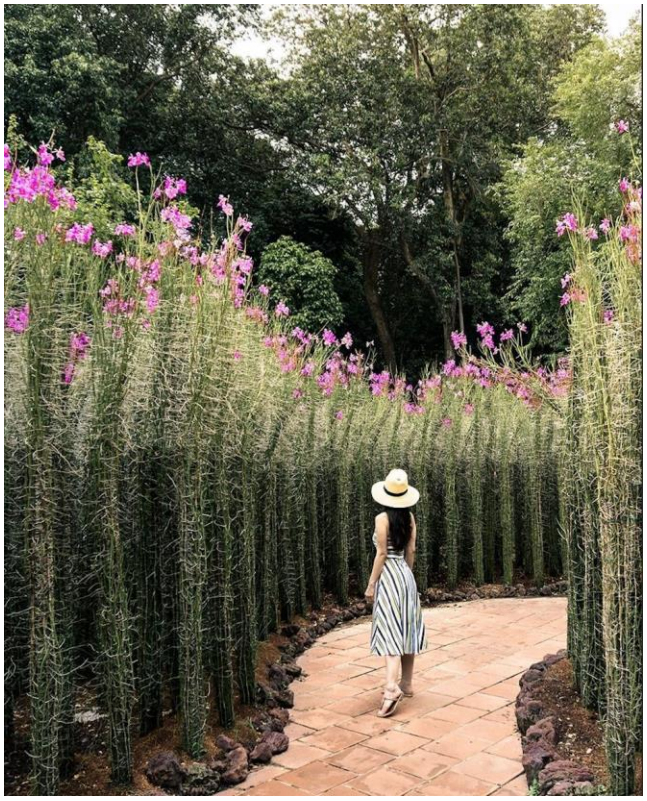
You can also tap on the correct models for secret animations

This image target to summon this area:

LEARNING FOREST

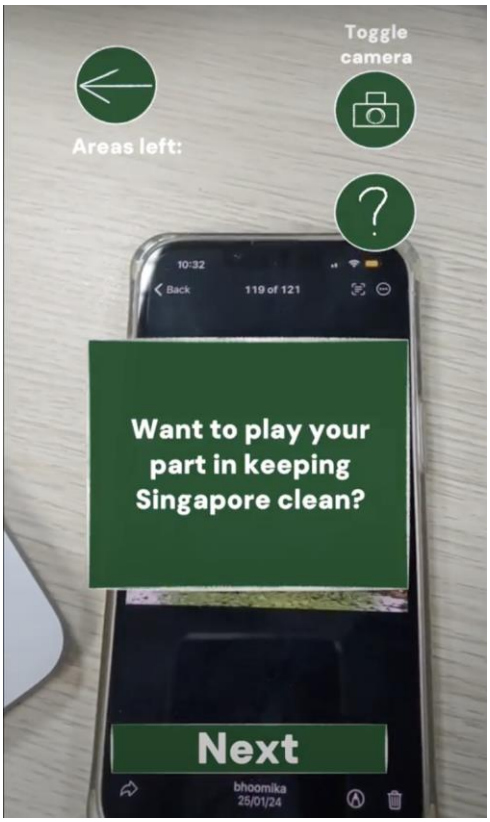
Collect

The image target used for this is:

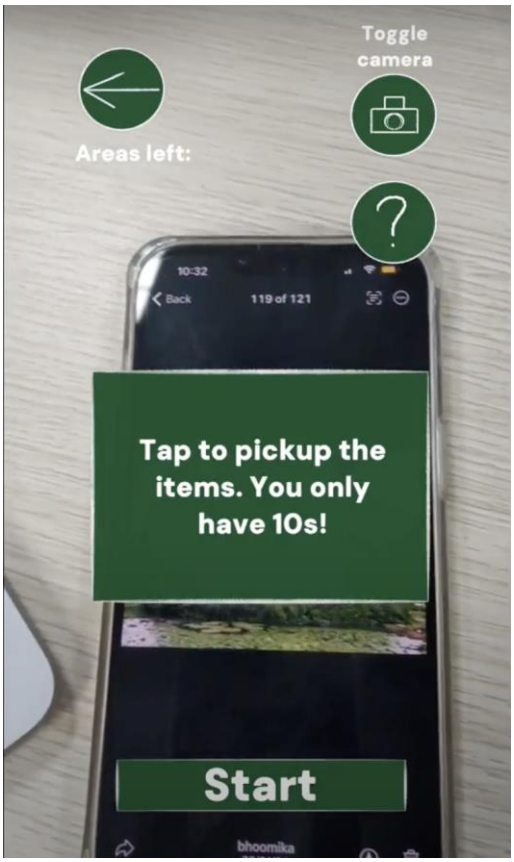


Collect takes place in the walkways of Botanic Gardens. Singapore is known as the garden city, and for being extreme clean. This allows visitors to try living as a local.

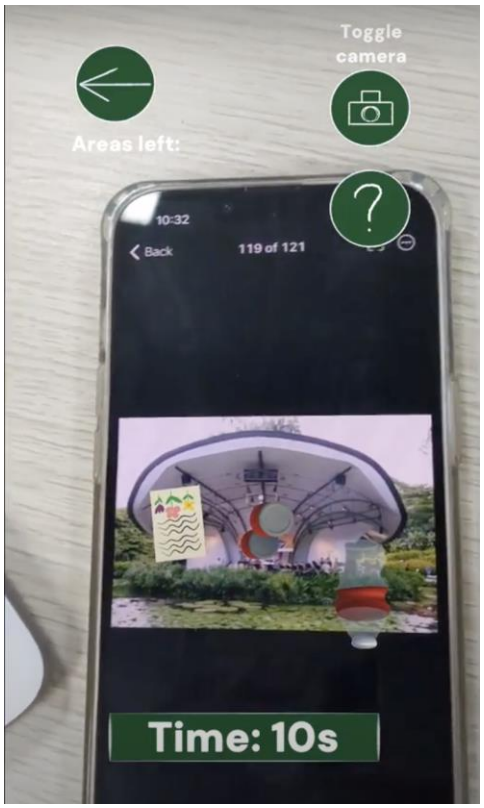
It begins with a set of UI that explains the user how Singapore is always clean, and how User can play their part in contributing to it.



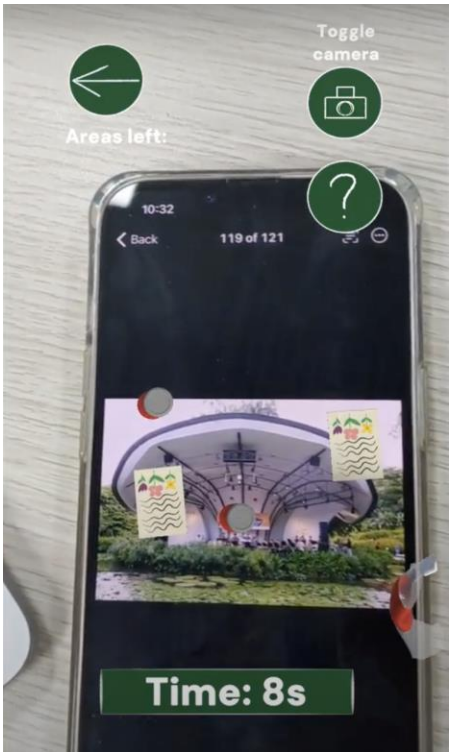
The User learns about the cleanliness rules here and is given the opportunity to try picking up items.



Upon pressing start, the user can then play the game.



User then has 10s to tap all the items.



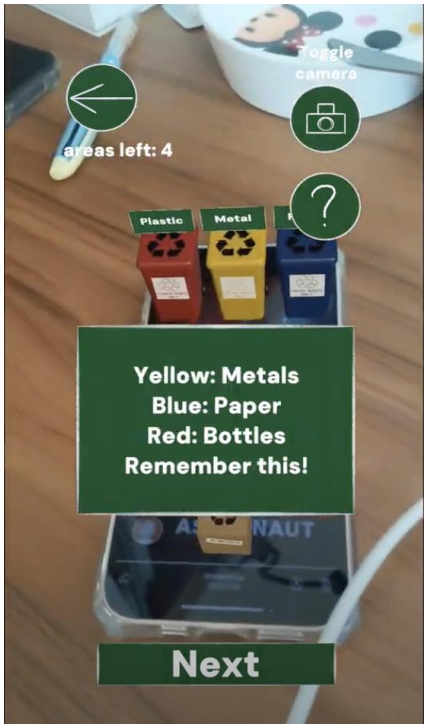
Users then can move on to the next UI panel.

Recycle

The image used to scan is:

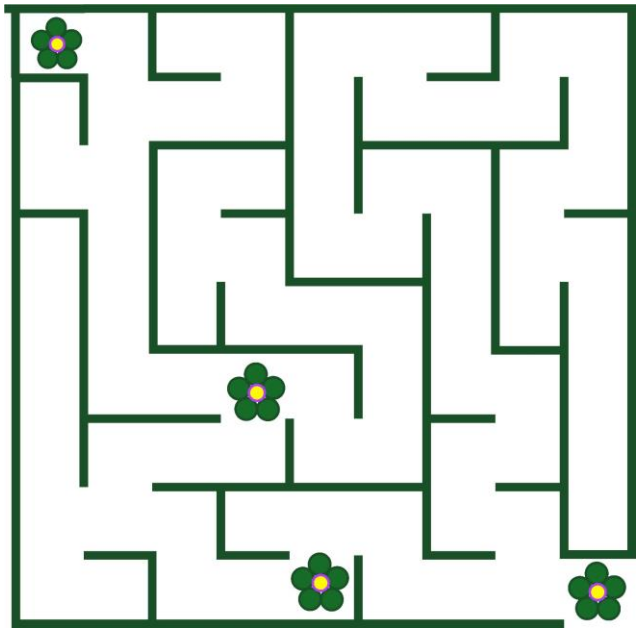
Recycle takes place in the walkways of Botanic Gardens. This is a follow up on the previous game where the User has collected the items. The user will now recycle items in the correct bins respectively.

It begins with a set of UI that explains the user how Singapore is always clean, and how User can play their part in contributing to it.



Maze

The image used to scan is:

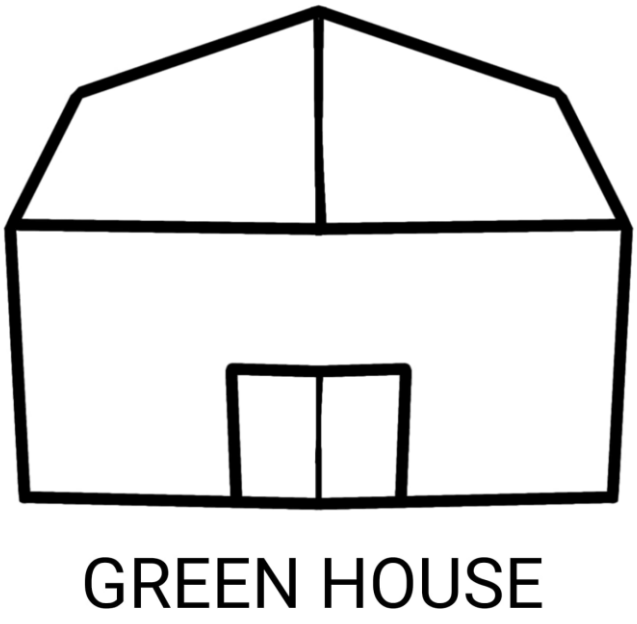


We are incorporating the idea of Garden Hedge Mazes into our game. The idea of a Garden maze is widely popular and can be seen in many gardens around the world. We have taken inspirations from many different garden mazes around the world. Applying this idea onto an AR Game allows the users to be more immersed and feel as if they are in the garden and exploring. Basically, you must get the monkey out of the maze because he doesn't belong there!!!

Greenhouse

The greenhouse in this app is only exclusive to the app, adding an incentive to finish the game.

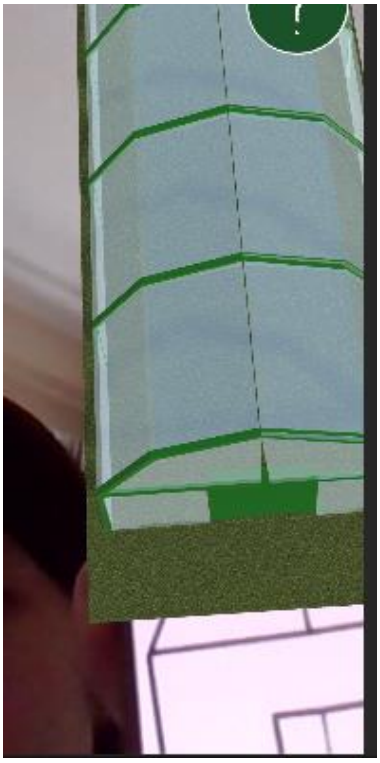
The image target is this:



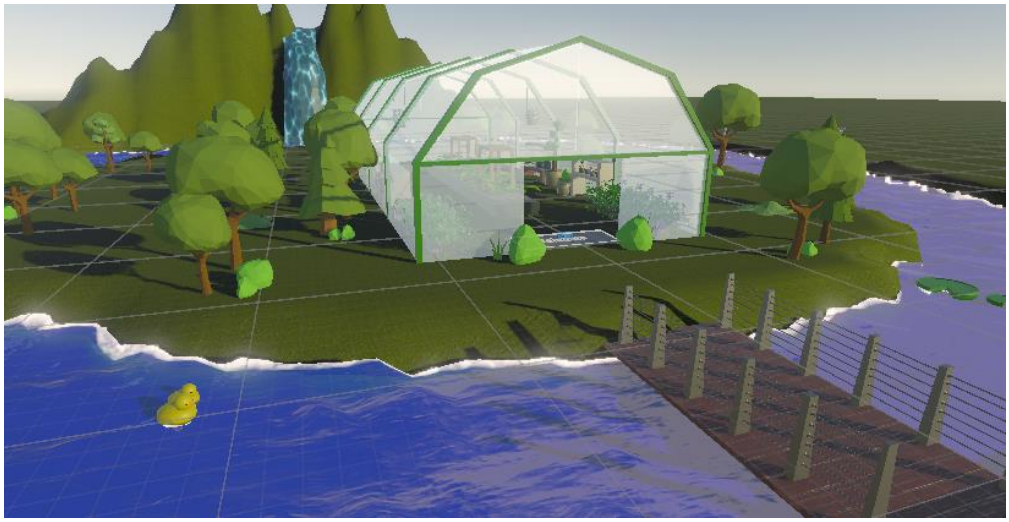
If the player has not finished visiting the 4 areas, when scanning the image target it shows this:

But if the player has completed all four areas it will show a notification:

When scanning the image, normal greenhouse where they can tap it and it will turn into the greenhouse scene:



The player will tour around the greenhouse area. This section is not AR



MVP (Minimum Viable Product)

A minimum viable product for our game:

- Player log in and sign up
- Toggle on and off button UI button
- A "?" button
- A mix of ground plane high ground

- Making sure all our base interactions can work, no hidden secrets to tap on
- Making sure the data of the maze score can be sent into our database
- Making sure that when all base interactions work, they can unlock the greenhouse
- Using a camera animation to give a tour on the greenhouse

Wishlist

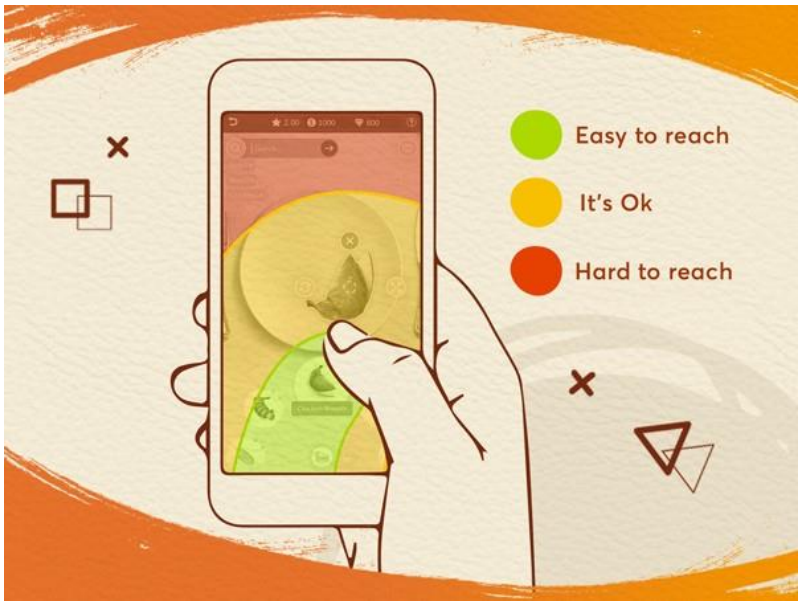
- The player can turn the camera in any direction during the greenhouse scene
- The player can tour the greenhouse through AR
- An option for a voice to play, which narrates the text shown on the screen
- Being able to animate all the UI panels shown on the screen for consistency
- Photo taking for the Gazebo decorating minigame
-

Things to note before designing for mobile apps

Optimizing UI placement

They should be in areas where it is easy to see and where users would not have a hard time knowing where they are. It is also recommended that the size of the target should be about 10x10mm, to reduce the likelihood of a misclick.

Additionally, it is important to know where some areas are easy or hard to reach, so most commonly used areas should be placed on the bottom side of the phone and harder to reach spots on the top of the phone



(PUNCHev Group, 2023)

Opting for minimalism for adding functions

Player's dislike having a screen with multiple features, text, options, and buttons everywhere as it can be messy and hard to navigate, thus they need to be minimalized, neat and simple to see

Aim for simplicity

Make the UI as simple but easy to understand as much as possible to make it more accessible and easier to focus on what is the goal or what the player wants to do.

Be consistent

Consistency creates a sense of familiarity for players, improving players' overall experience. Consistency can be from use of font, colors, style and icons.
The lack of consistency can make players confused at times questioning why it looks weird or different from the rest.

Building a suitable ambience

Ambiance must match the target players. “The ambiance is, in other words, the audiovisual of your game.” (Oentoro, 2022). Thus, why visuals must match target players preferences. Therefore, building a great ambiance is based on the genre of the game

Things to note when making UI for those who are color blind

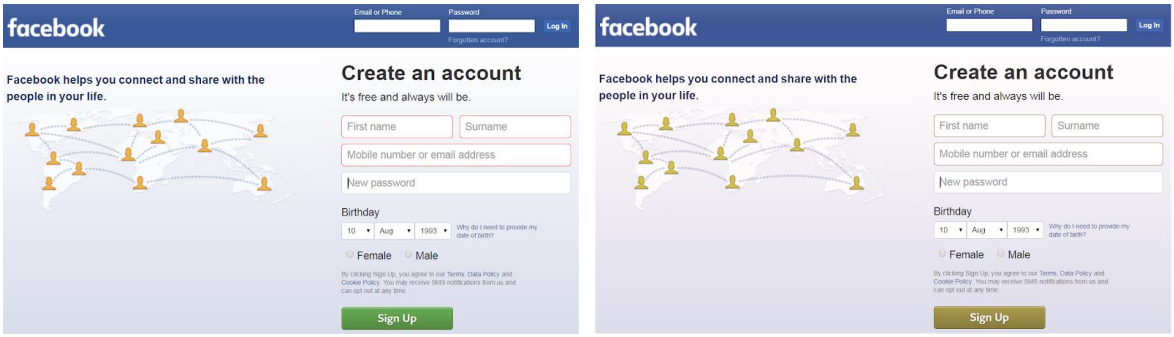
Why do we want to focus on making our app inclusive to those who are colorblind? It is because colors are very important in conveying a message when it comes to UI/UX design, however there are 300 million people in the world (8% of the worlds population are color blind) (ClintonEye, n.d.). If we do not keep colorblindness in mind when designing, we could loose out 300million people from playing our app, due to having difficulties not being able to see things cleary or accurately and will lead to motivating less people in visiting Botanic Gardens, which is our target goal.

Thus when designing our UI, we must make sure that the methods and colors used, do not limit people with color blindness from being able to play our game.

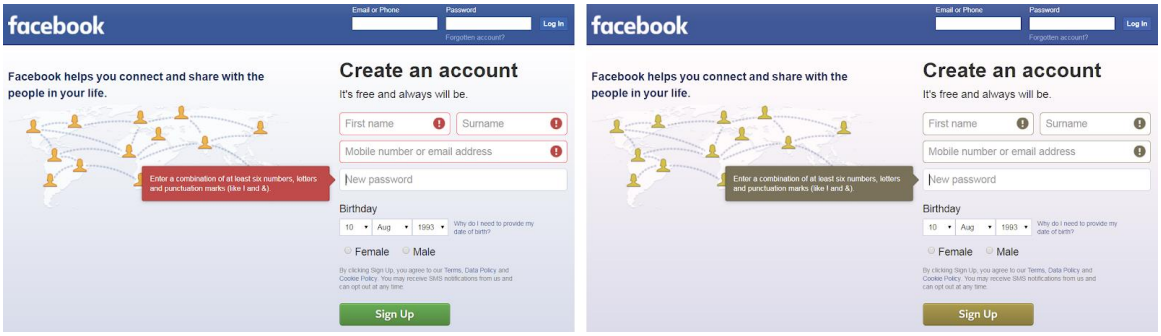
Utilize symbols and labels

You should not rely on colors to indicate difference, an error or information in UI, because if people are unable to tell the difference between the colors due to their color blindness, they may be prevented from telling important details or cues based on color

For example, looking at facebooks sign up page, if color is the only identifier, it will look like this (red-blind) . It is hard to tell that there is an error in signing up and may cause frustrations to the color blind user



However when using symbols and having error messages pop up, it is much more easier to tell that there is an error in signing up the new user



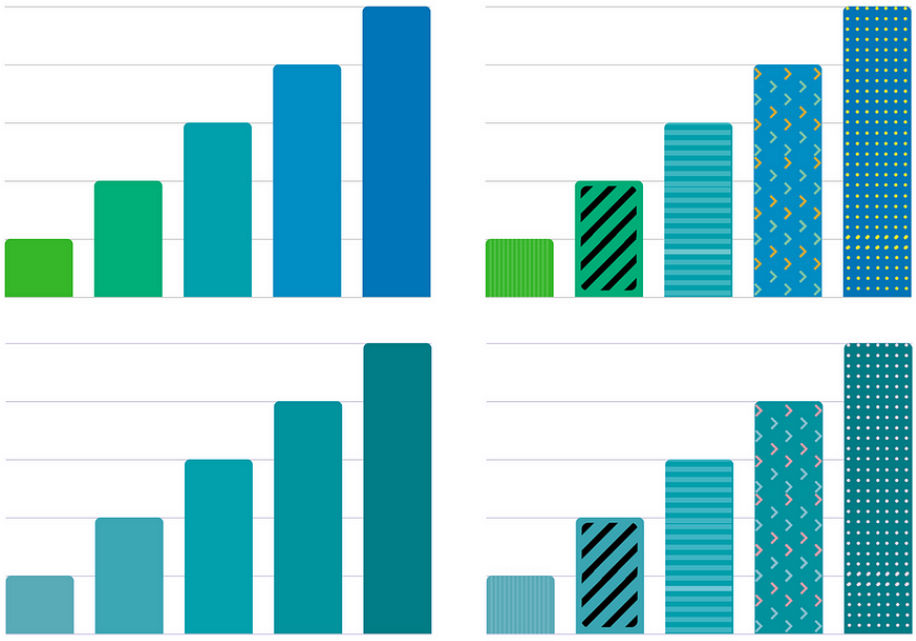
(Staats, n.d.)

Consider minimalism

Minimalism usually does not use that much colors, this means that the lesser colors, the less chance for confusion. (Payne, 2020)

Using patterns and textures

One easy way to distinguish two items from one another is to use patterns and textures. If users are unable to differentiate colors, they will still be able to tell the difference with the use of patterns and textures. In this bar chart, for example, it is easier to tell the difference due to the patterns on the bars, rather than using the colors of the bars to differentiate things



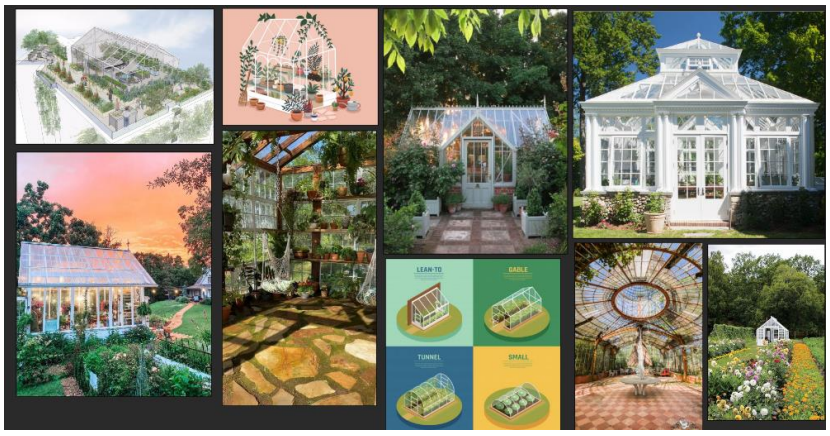
(Shaffer, 2016)

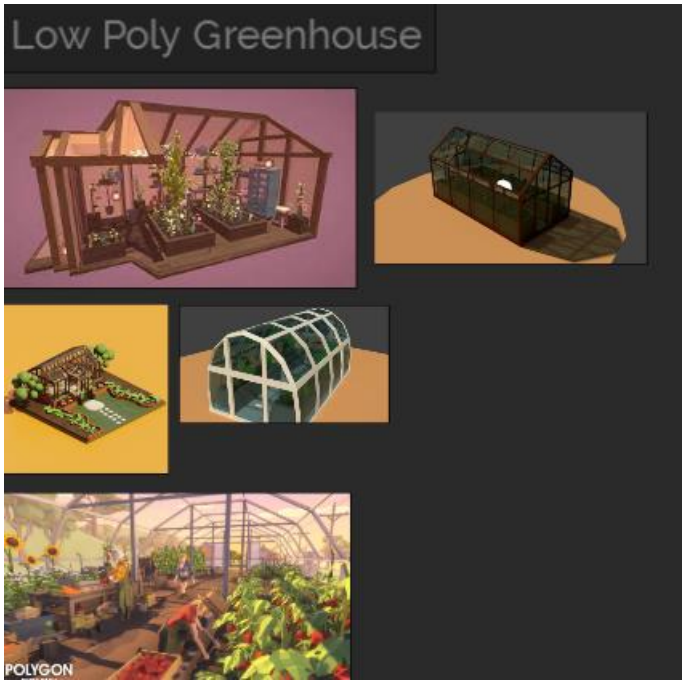
A list of color combinations to avoid

- green-red
- green-blue
- green-brown
- green-black
- green-grey
- blue-grey
- light green-yellow
- blue-purple

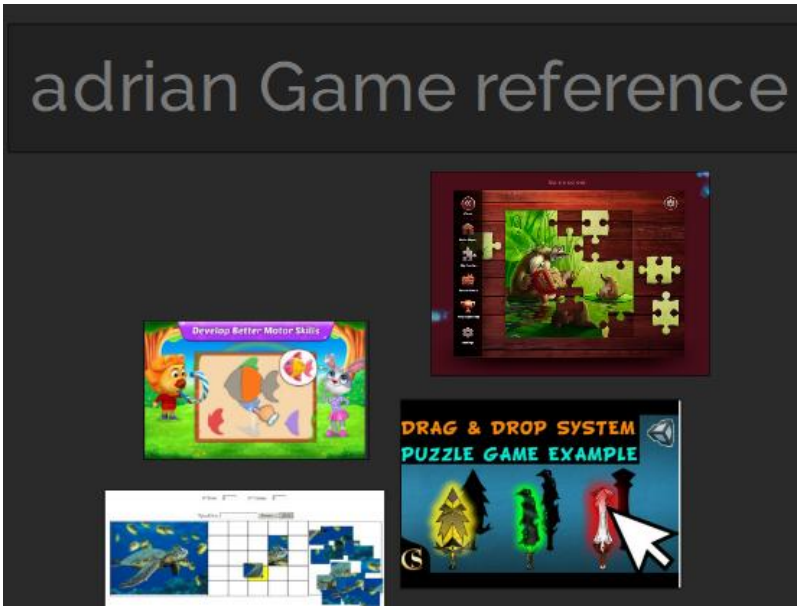
Reference images

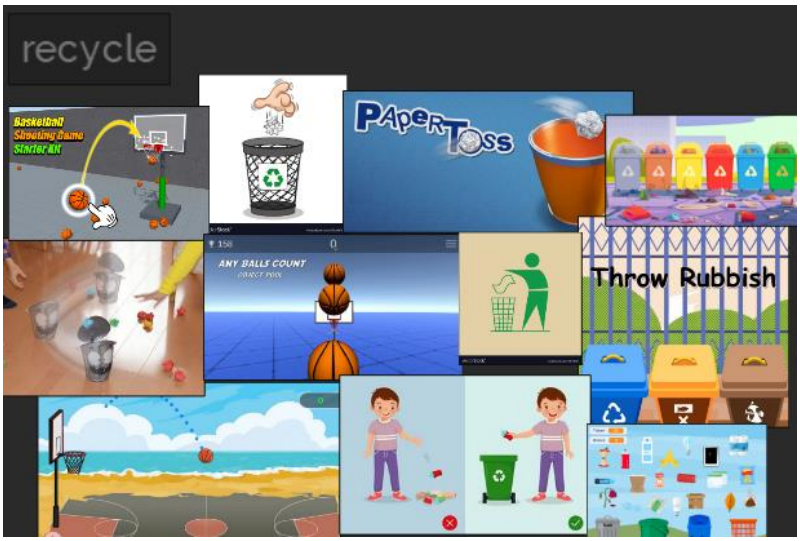
Greenhouse reference images

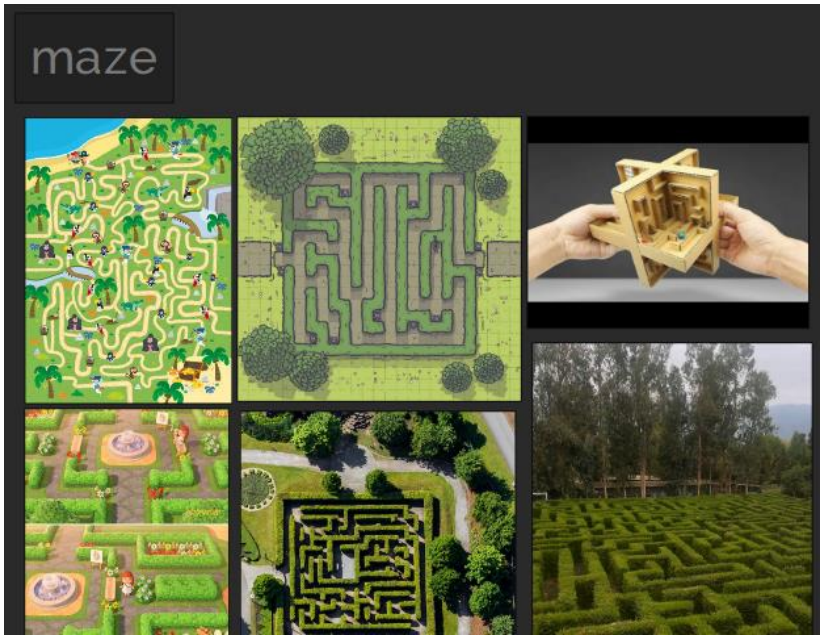


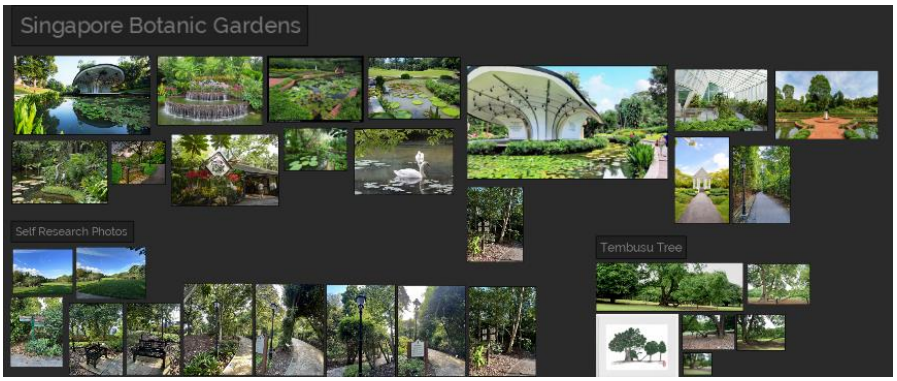


Extra images for individual things

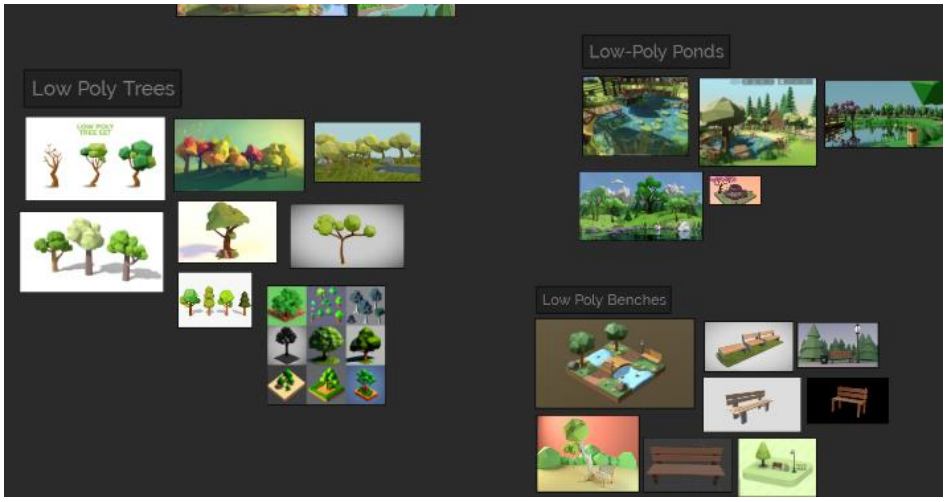


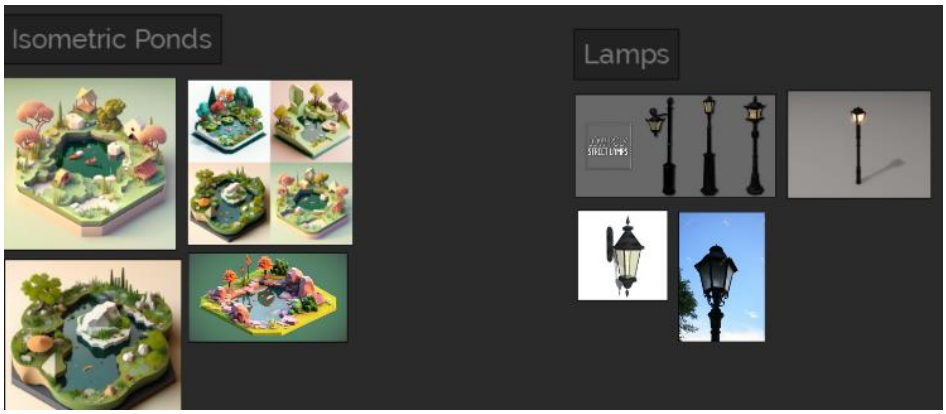


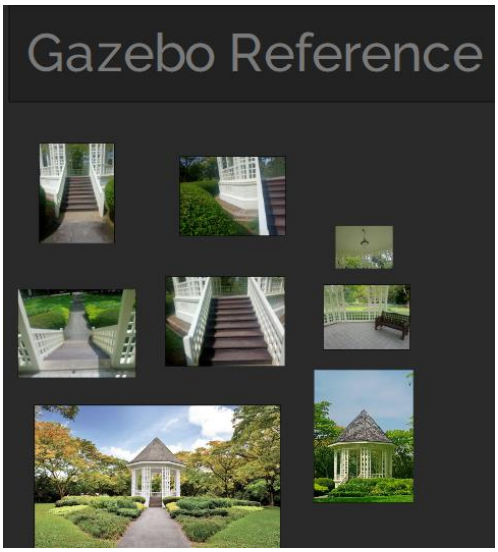

maze


Singapore Botanic Gardens
Self Research Photos
Tembusu Tree

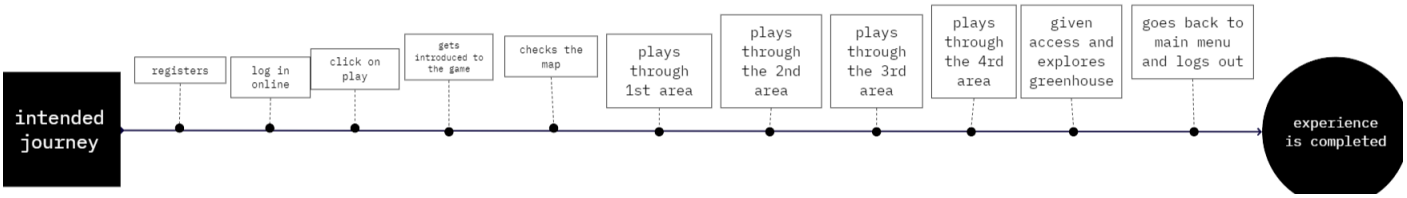

Low-Poly Gardens
Floating Islands
Low Poly Terrain/Environments







Initial user flow before development



Design rationale

Environments popping with each image

To make each area more immersive, there will be an environment that will pop up to make the area, so it feels like their visiting another area

Here is an example

Font Choice

We chose the font Sans Serif DM. The reason why we chose this font is because it is easy to read, and it is also inclusive for those who is dyslexic since fonts under the serif family are usually recommended for those with visual impairments, as in this article relating to fonts for those with dyslexia, it states to "Use sans serif fonts" (bdadyslexia, n.d.) and another article talking about fonts for people with visual impairments, stating "The goal is to use easily recognizable characters such as Arial, Verdana, Tahoma and Sans Serif versions of any typeface are often more legible" (Willings, n.d.)

Here is an example of the use of this font

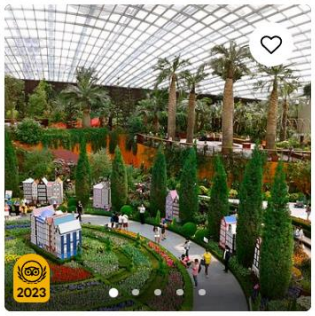
Additionally we have a member on the team with convergence insufficiency and oculomotor dysfunction, and they have stated that this font makes it easier for them to read the text.

We want as many people to play our game as possible to promote botanic gardens, thus why we are trying to make it as inclusive as possible for everyone, through our font choices

Why Botanic Gardens

Originally when doing research, we were considering picking Chinese gardens or Gardens by the Bay, as seen in the mind map, since those three gardens would constantly pop up for articles containing the best gardens in Singapore

This was tripadvisers list on best gardens to visit in 2024.



1. Gardens by the Bay

60,363

Points of Interest & Landmarks • Gardens

Central Area/City Area

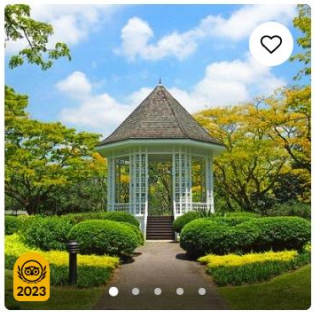
Open now

Admission tickets from S$11

By estervJ7957EV

Wonderful with unforgettable experienced, we visited SuperTree Observatory, **Flower Dome**, with so many fresh and beaut...

See tickets | See tours



2. Singapore Botanic Gardens

20,015

Parks • Gardens

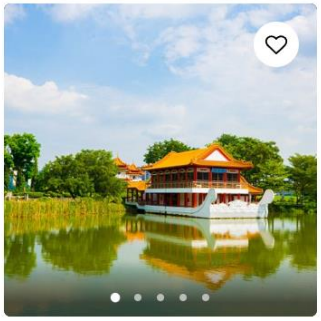
Tanglin

Open now

By dontcontact

Outstanding botanical gardens - highlight is the **orchid garden** (cost for entry here) as well as the ginger garden, bu...

See tours



8. Chinese and Japanese Gardens

748

Gardens

Jurong East

By kopitravel

The Chinese Garden and his brother the Japanese Garden, are located near the Jurong Lake Gardens, in Jurong East. The...

(tripadvisor, 2024)

Holidify list on 15 tranquil parks in Singapore

1. Gardens by the Bay

2. Singapore Botanic Gardens

The serene Singapore Botanic Gardens is dotted with small ponds (Source)

7. Chinese and Japanese Garden

The picturesque Chinese Garden of Singapore (Source)

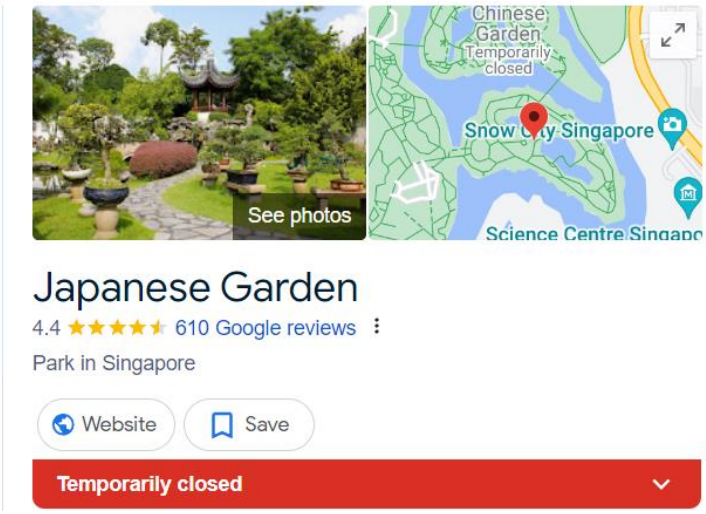
(Makan, n.d.)

The reasons we did not pick gardens by the Bay is because we felt that gardens by the bay felt too touristy and did not feel very lush.

Secondly, there are many attractions there that you have to pay money for, such as the flower dome, cloud forest etc. We felt that it is better to promote a garden where anyone can afford to see its attractions.

Thirdly, we did not pick it as unless you can take a car or take the Thomson East Line to Gardens By The Bay Station, traveling towards there may be bit difficult. We would rather prefer a location that is easier to travel to for most people.

Our second choice was the Chinese and Japanese cultural gardens, due to its lush beauty, the wonderful animals living there, its beautiful structures and its cultural importance. However it is now “undergoing redevelopment.” (nparks, n.d.)



In the end we went with Botanic Gardens as it has many attractions which are all free but the Orchid Garden, it is big and lush, has many creatures living there, and it also promotes learning and the conservation of endangered plant species.

Secondly, Botanic Gardens is accessible through many public transport systems, such as using the Circle line and downtown line to go to Botanic Gardens Mrt, and through many buses as well

Additionally, mentioned in our background, Botanic Gardens is also a UNESCO World Heritage Site which enhances the allure of Botanic Gardens, making it a compelling destination for visitors interested in exploring a site of importance in exploring a site in Singapore, rich in cultural, historical, and natural significance.

Prompters

There are many prompters in the game in case the player ever gets lost.

The player is introduced to the game and taught all the controls

if player is lost they can click on the ? button for more instructions.

Players can click here if ever lost so they can read the instructions again

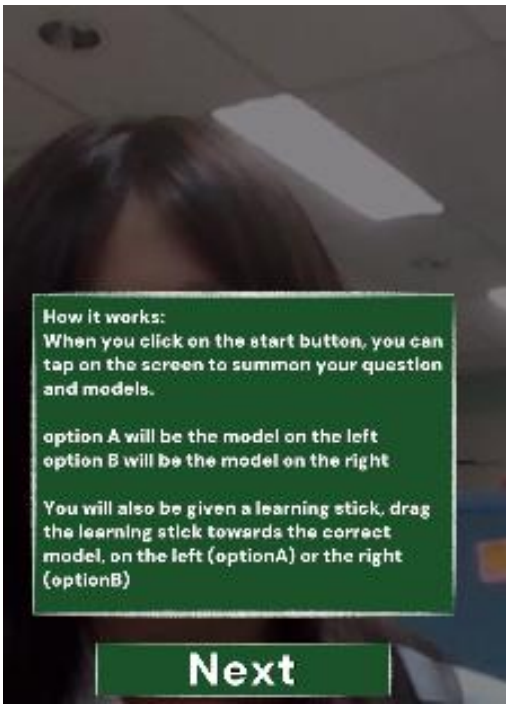
There is a prompter on the top to let the player know how many areas there is to visit left so they aren't lost on how many more areas they need to visit till visiting the greenhouse

Players can click here if ever lost so they can read the instructions again

For every area a player will always be given a quick introduction on how the controls work

For the learning forest area, the explanation UI will switch out so they can check the instructions for this interaction again easily

When clicking on ? instead of the regular instructions it switches out to instructions for the learning forest game



There are also custom instructions made for the greenhouse area where they can also check the instructions again with the ? button

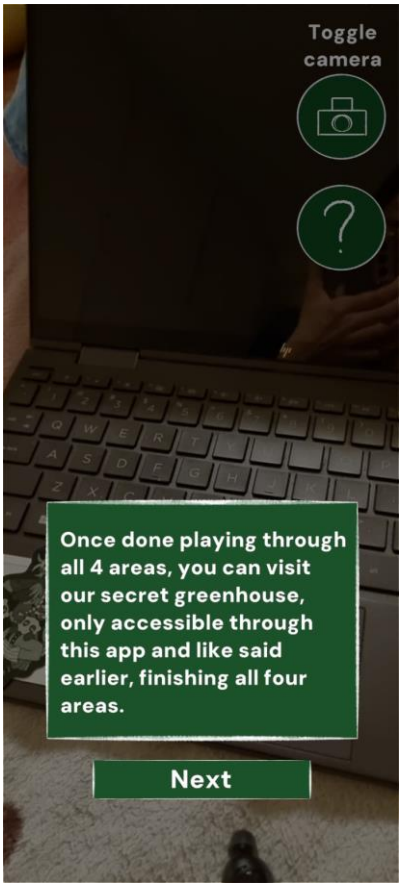
When clicking on ? it will show the instructions again for the greenhouse area

UI panels

The UI were drawn by Grace Foo with a sketchy/hand-drawn style, as they have been associated with human expressions to this digital interface, making it not feel artificial but to feel more natural and authentic, which fits better with what nature is.

When picking the colors we considered what color combinations to avoid as stated earlier in our research into making UI more inclusive to those who have color blindness

Here is what they look like in game:



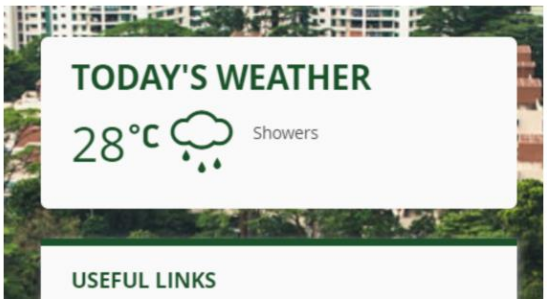
The UI are mainly Green and white, the main use of green is because the color green evokes the feeling of nature, due to its "connection to nature and life" (Darch, 2023).

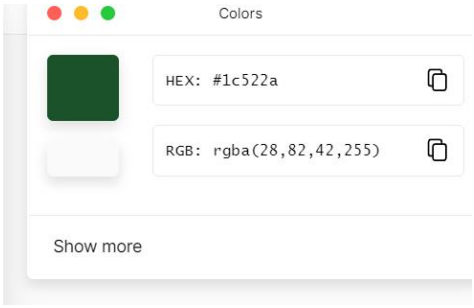
Secondly, green is a color for learning, as it is one of "most important color students should have access to in their learning environments." (Springer, 2022), As it makes people feel "motivated", "relaxed", "focused" and "inspire creativity" (Springer, 2022). This is a good thing for our project, since we want players to learn more about Botanic Gardens, and nature in general

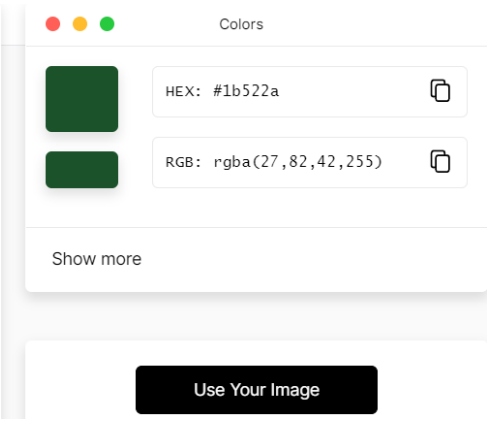
The white is meant to make the buttons stand out and easier to see with its outline and make things easier to read since it contrasts well with the green

The UI also uses a darker shade of green, as those who are red, green colorblind can distinguish things better “based on light vs. dark”, (Shaffer, 2016) therefore making the panels darker in color so that the text in the panels is easier to read due to the contrast of the dark panel and the light-colored text. Additionally, since using white against the dark green, even with colorblindness, it will still be easy to read the text due to tone contrast, and like mentioned earlier, make UI easier to read

We borrowed this shade of green from the National Parks Board Website





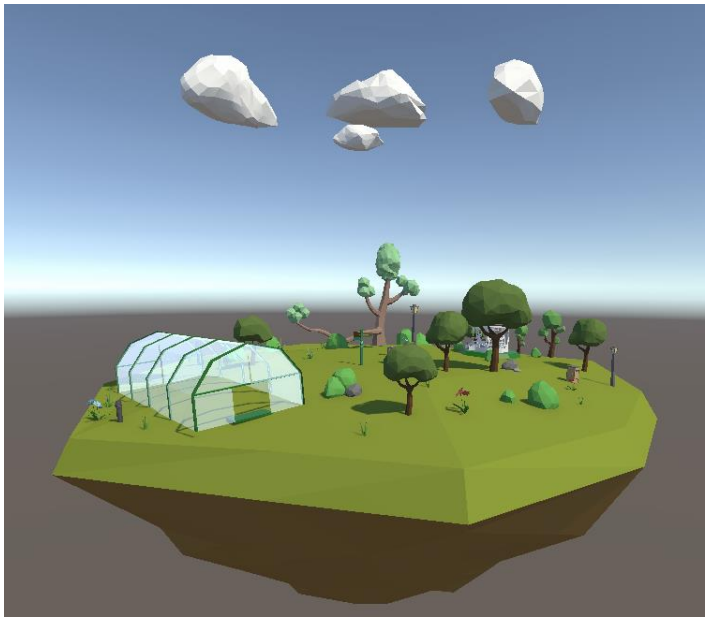


The UI panels and buttons done by Grace can be found here:
https://drive.google.com/drive/folders/1AHFYxqU-8ock-qeKLGvIs-hmPXp23uKh?usp=sharing

Features

3D map

Players can see a miniature map of Botanic Gardens in our AR game



Fusion Game

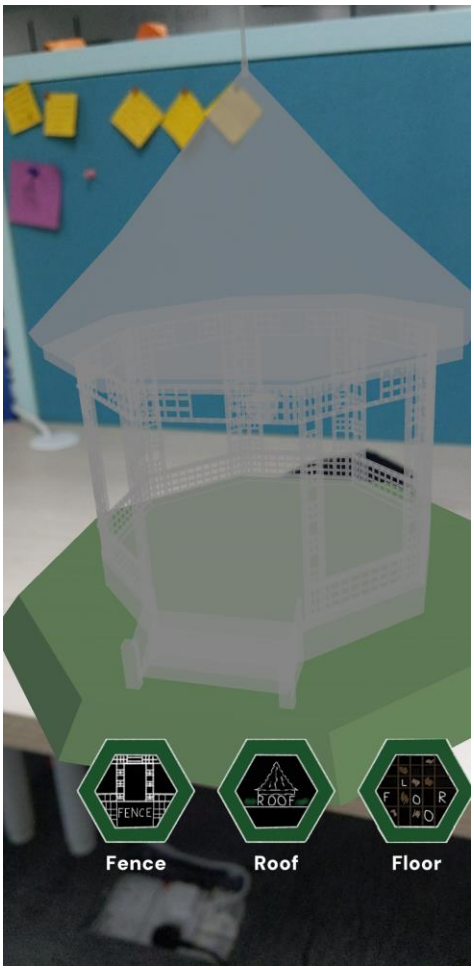
The main puzzle of the minigame is based on the iconic Botanic Gardens Bandstand.

The Bandstand was chosen for this mini game as it is an iconic landmark in Botanic Gardens. It is one of the first things that people see when searching up Botanic Gardens making it a familiar figure for people curious on visiting Botanic Gardens.

This minigame aims to promote the one of the various landmarks that can be found in Singapore's Botanic Gardens for tourists and locals alike.

Opening the minigame first introduces the player to this prompt:

After pressing next the player should be taken to another prompt that says “Build !” and once pressing it, they will be greeted with the minigame’s UI and after scanning the Bandstand Image, they will see the model with greyed-out parts.



Pressing the UI buttons will use ground plane to spawn in the respective models that the buttons indicate. The player can drag them onto the greyed-out area to fuse the parts to fully build the Bandstand.

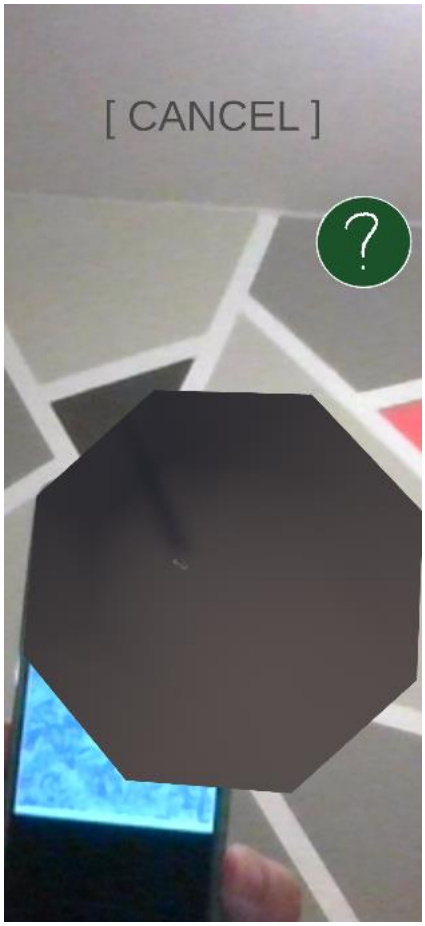
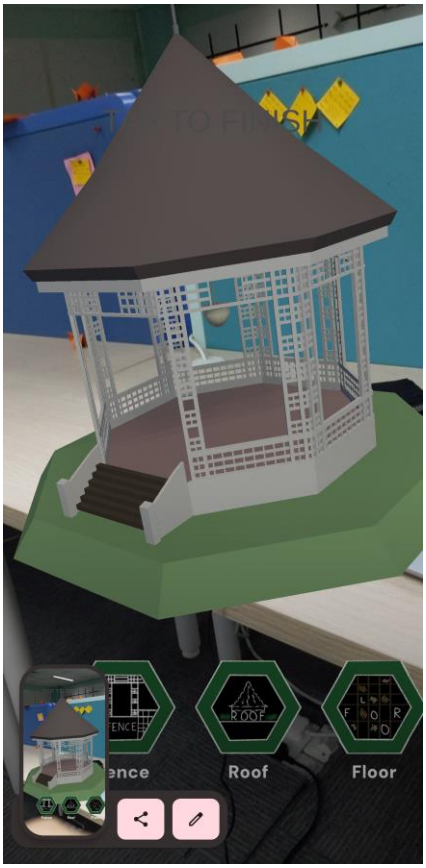


Image shows the roof being spawned in after the player presses the roof button.
Pressing "[CANCEL]" cancels the "build mode".

After finishing the fusion minigame, the completed Gazebo should look like this with a prompt telling the player to tap on the finished build:



After tapping on the finished model, the player will be taken to a decoration minigame where the player can decorate the Bandstand using a new UI panel. Once the player feels like they want to play the next minigame, they can press the finish button.

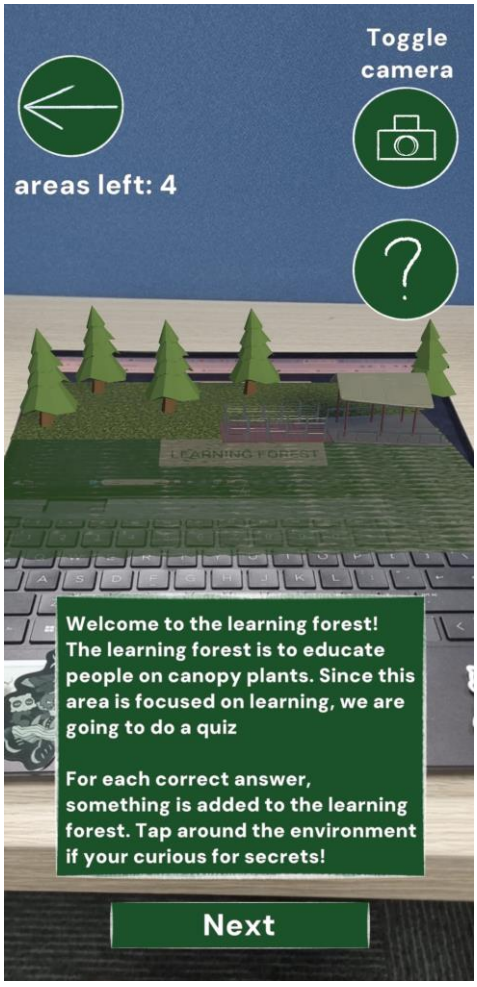
Learning Forest

The quiz game takes place from a real location from Botanic Gardens, the Learning Forest

The learning forest is meant to teach people about different parts of nature such as canopy plants and our freshwater wetlands ecosystems. (Botanic Gardens, n.d.).

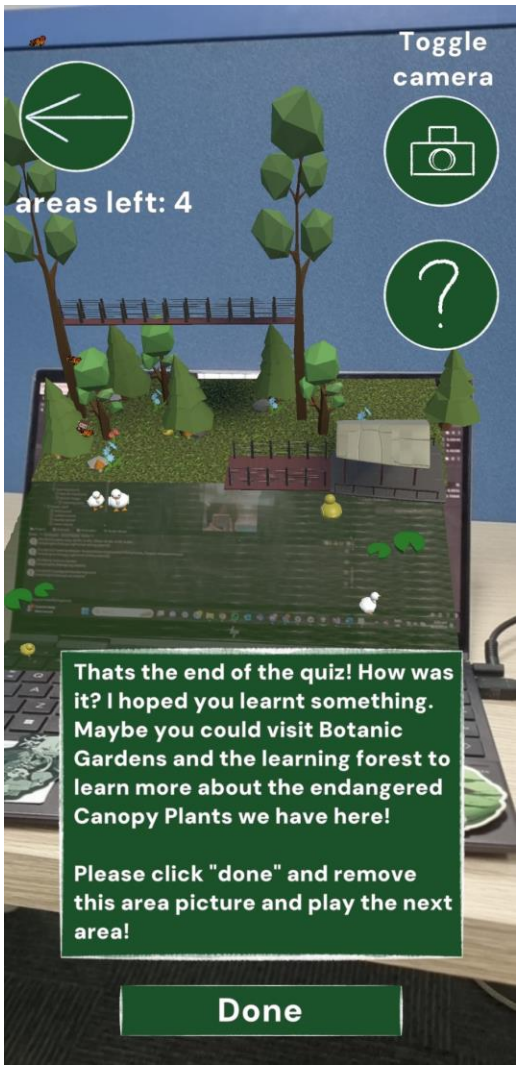
This quiz is meant to teach people more on features at Botanic Gardens, so they will learn more about it and what they can do there so there, and since the quiz is based on learning, we decided to pick the learning forest to be the area where the quiz takes place since they both promote education.

The area looks like this when scanning it:



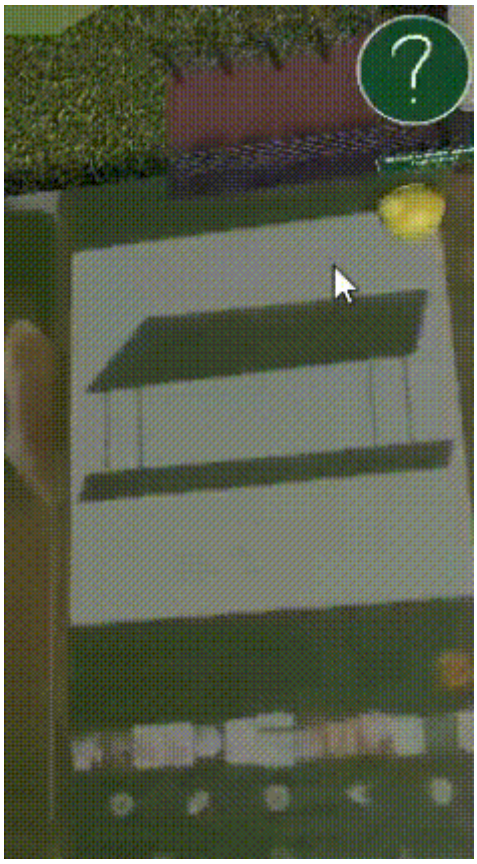
To play the game , they need to tap on the screen to summon the models of the question and drag the stick to the correct model

When answering questions right, new things will spawn in the scene, if answering all correct, it will look like this:



This is done to motivate players to try their best to answer them all correctly. There is even a bonus where if the player taps on models, they will play animations and sounds. There is also UI buttons to make it more noticeable that players can tap on the models

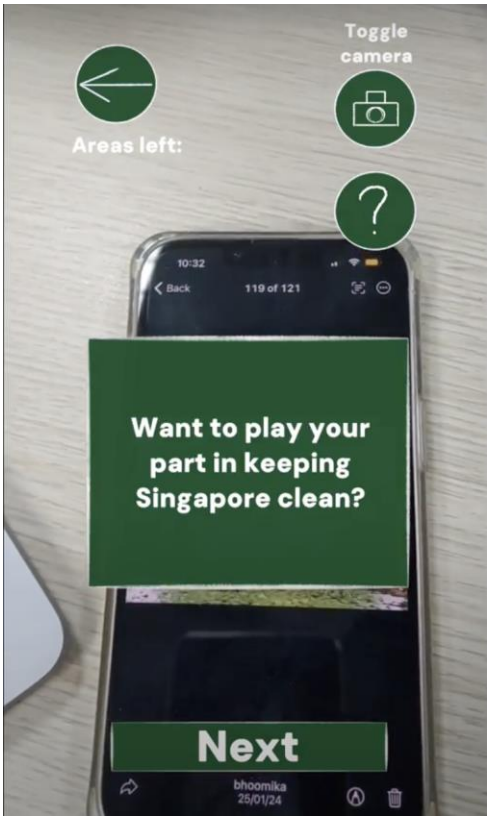
Here are some of the animations



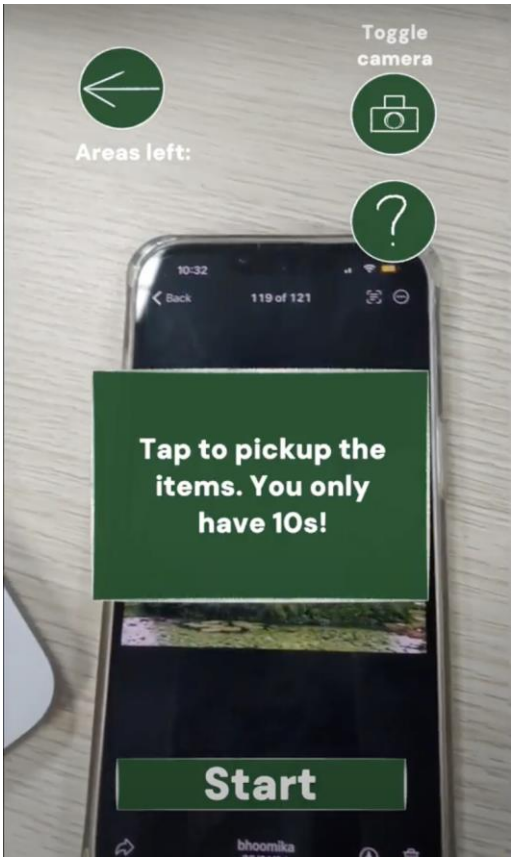
Recycling and collecting

Collect takes place in the walkways of Botanic Gardens. Singapore is known as the garden city, and for being extreme clean. This allows visitors to try living as a local. This is also to teach players to collect the trash seen if they do visit botanic Gardens in real life

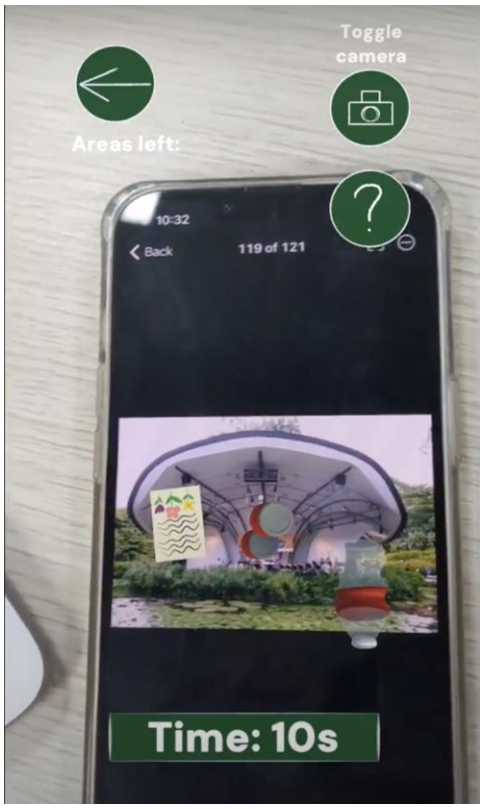
It begins with a set of UI that explains the user how Singapore is always clean, and how User can play their part in contributing to it.



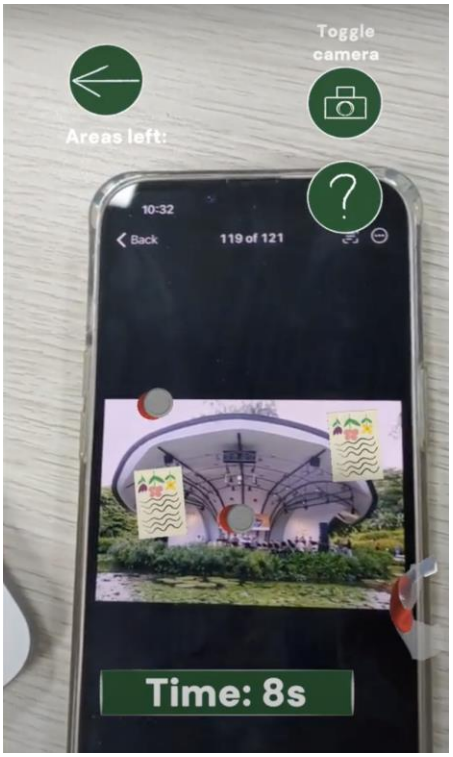
The User learns about the cleanliness rules here and is given the opportunity to try picking up items.



Upon pressing start, the user can then play the game.



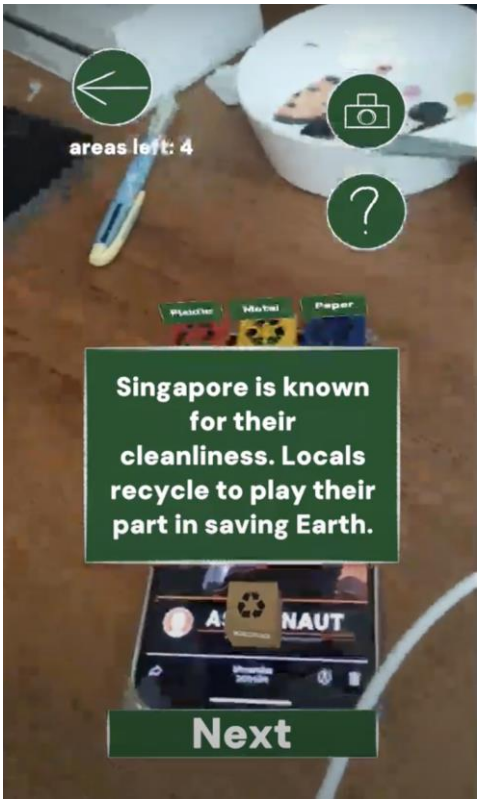
User then has 10s to tap all the items.



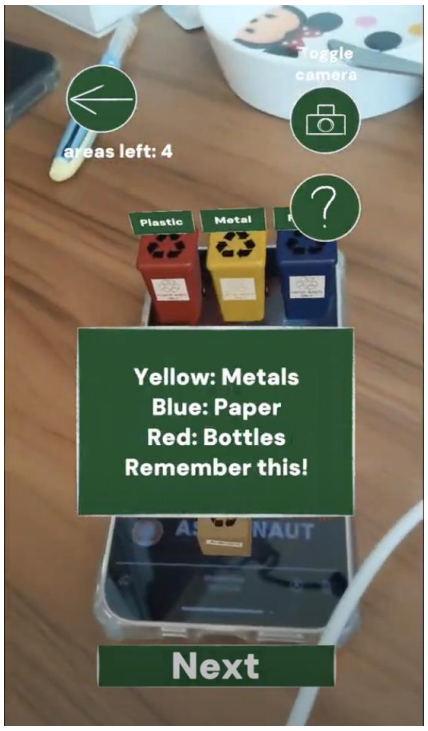
Users then can move on to the next UI panel.

Recycle takes place in the walkways of Botanic Gardens. This is a follow up on the previous game where the User has collected the items. The user will now recycle items in the correct bins respectively. This is to teach players how to properly recycle, so that they keep our planet more green and when visiting Botanic Gardens, they know how to keep it clean

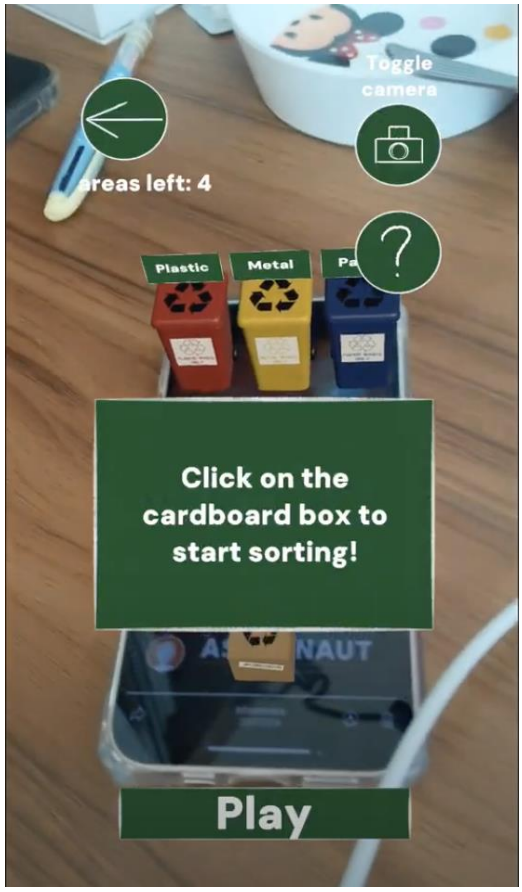
It begins with a set of UI that explains the user how Singapore is always clean, and how User can play their part in contributing to it.



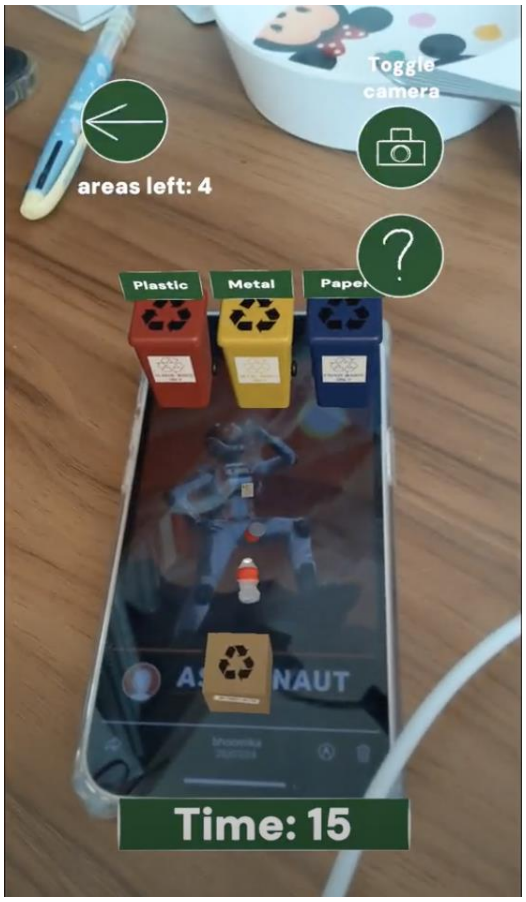
User begins with a set of educational UIs



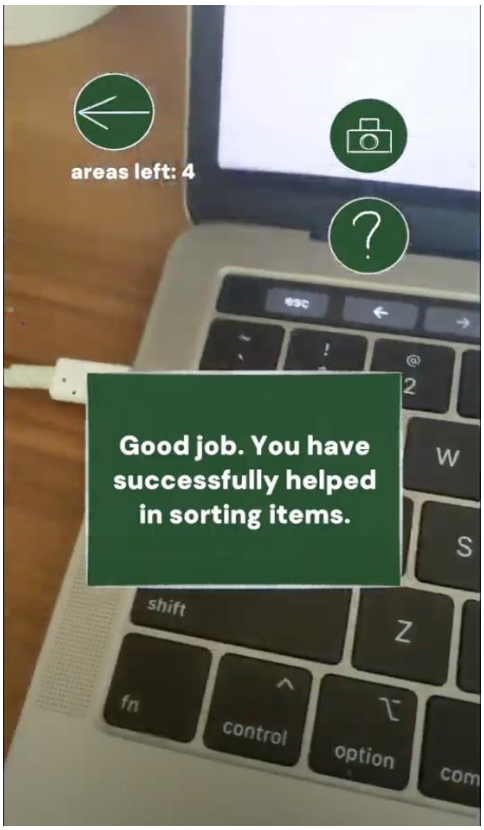
The user is taught about the colors of different bins.



User clicks ‘Play’ to start the game. The timer starts.



The user touches the box to spawn the item. The user then touches the item to select it. It can be dragged to the correct bin. If it goes to the wrong bin, a ‘wrong’ sound is played to indicate the item has gone to the wrong bin.

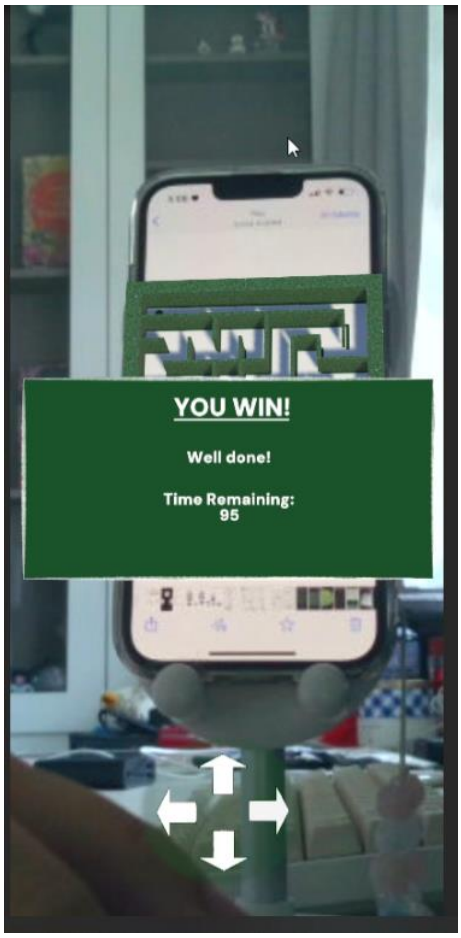


After time's up, the box cannot spawn anymore items. End UI panel pops up.

Maze game

Get the monkey out of the maze!!

Players will scan an Image Target (Maze 1) and a canvas will pop up telling them the rules of the game, and they can press start to start the timer while holding the Maze 1 Image target. As the timer goes down, they must complete three different mazes. After completing Maze 1, it will change to Maze2 and later Maze3 when completing Maze2. When the monkey in the maze touches the exit of the third maze, it will stop the timer and end the game.



The maze does not exist in the current Botanics Garden, so likewise with the glass house, it is exclusive to our game.

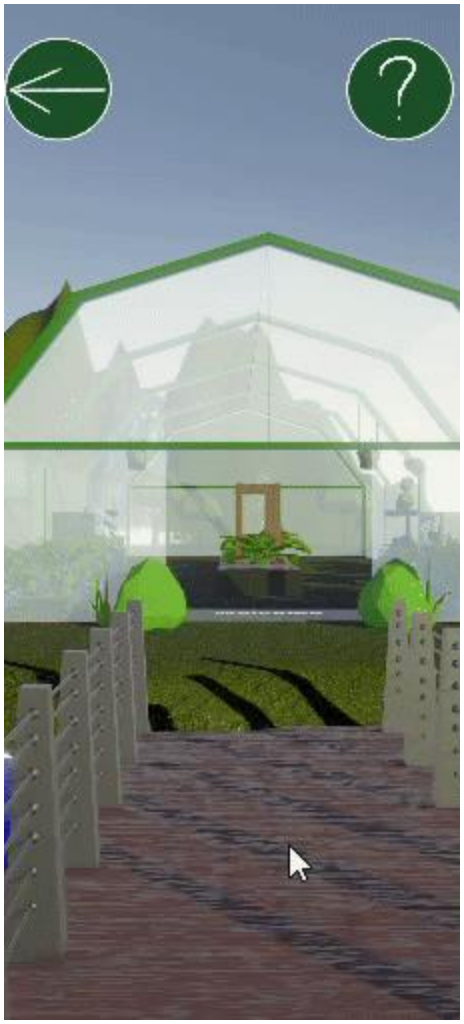
Glass house visit

The glass house visit is only exclusive to this game, where they can only see and tour it once they have played through all the main 4 mini games/areas. This is to motivate the player to play through the whole game to see this special greenhouse. The idea is inspired from the Tropical Montane Orchidetum (Tan, 2021) within Botanics Garden and in our version, it is an extension of the Botanics Garden itself.

The glasshouse at the Botanics Garden called the Tropical Montane Orchidetum is within the National Orchid Park. It simulates the experience of ascending through a tropical montane forest and showcases a diversity of orchids and other plants

In the game the player is able to swipe on the screen to control the camera, so they can look around and tour the area on their own time

Here is a quick demo and look at this area:



Picture competition

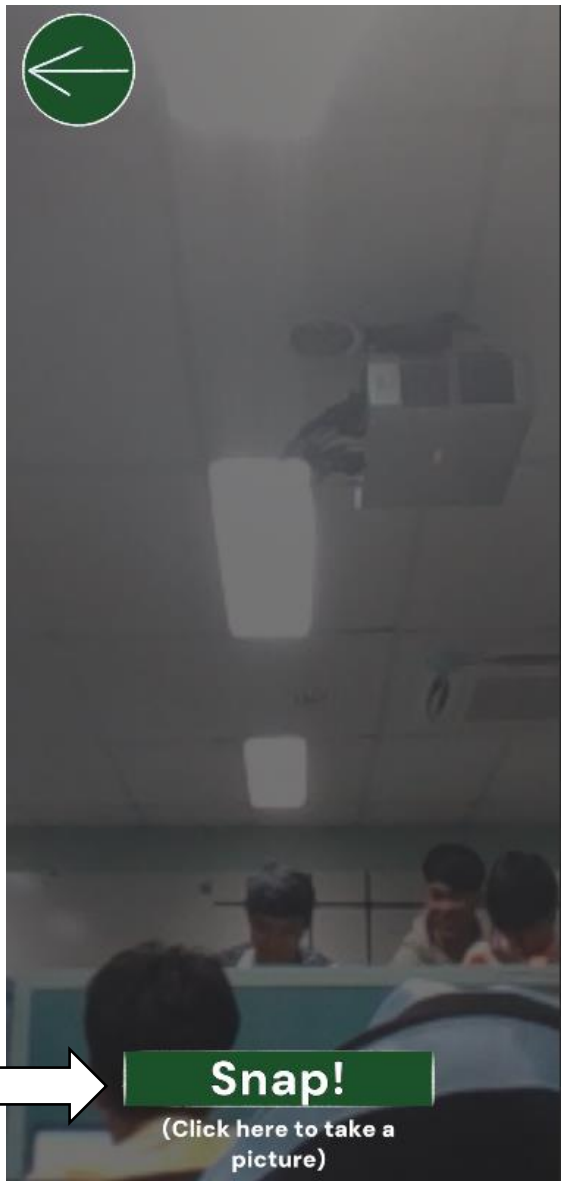
Players in the game can take a picture of themselves at Botanic Gardens and send that photo into our database to enter our competition, only pictures taken at Botanic Gardens will be accepted. This is to create an incentive for players to actually visit Botanic Gardens after they play the game and to take a nice picture while they are there.

To access this, it is through the Main Menu

They will first see this UI pop up explaining how the picture system works

After clicking next it will reverse the camera, where they can click on snap! and it can capture the picture of the player at Botanic Gardens

When clicking this, the player will return to the main menu



When clicking here, it will capture the picture and send it to our database

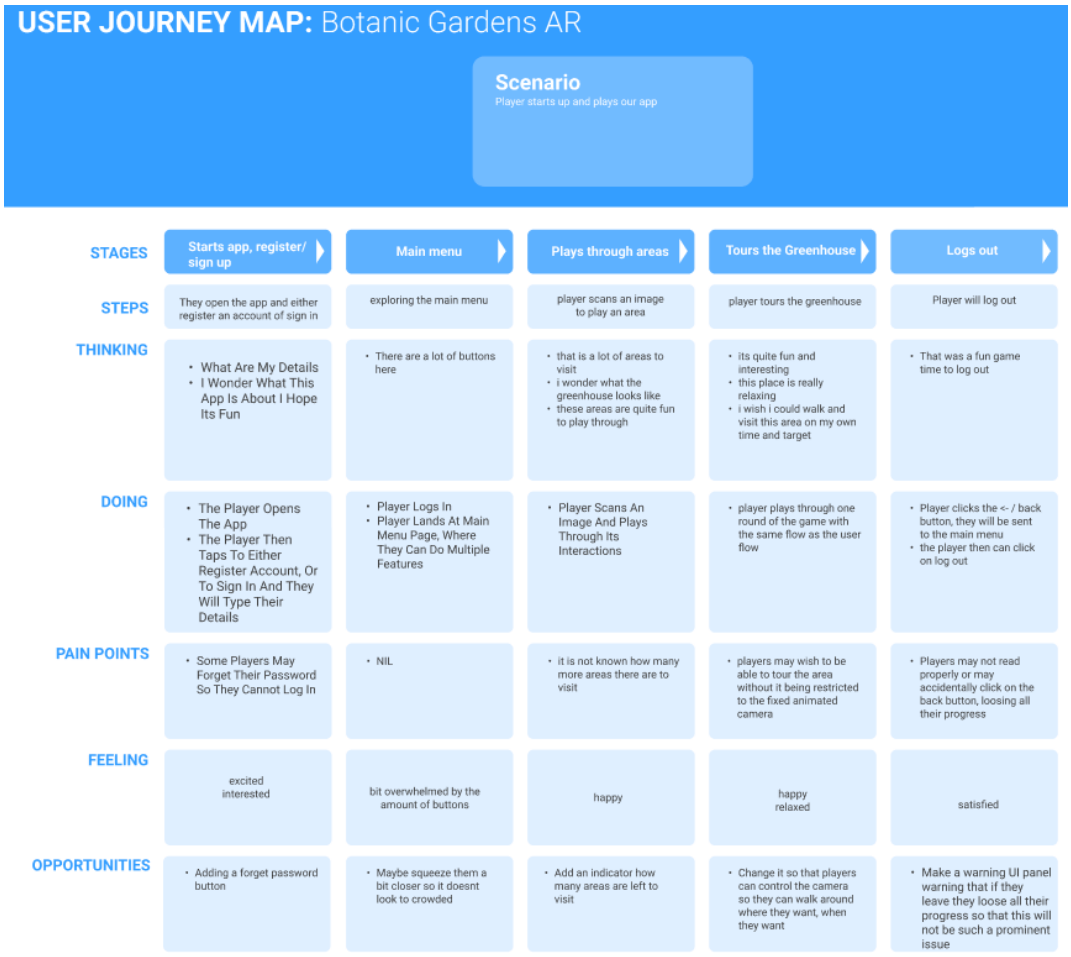
Prototype

Prototype shared link here:
https://www.figma.com/file/81Yl7xiNCJpKGqAbdAOjBW/assignment-3?type=design&node-id=67%3A27&mode=design&t=oIqn2xIxooN4lAhE-1

Prototype demo video:
https://ivid2.np.edu.sg/media/EXD_BotanicAr_PrototypeWalkthrough/1_udrcnu96

Rough game script: **https://docs.google.com/document/d/18OePOeOV-jAeEODTVAW8US6H9ahEUA7dXleT4sDFS_4/edit?usp=sharing**

Final User journey



Usability tests

The Usability video:
https://ivid2.np.edu.sg/media/EXD_BotanicAR_Usability_Tesing/1_9mmkybap

The usability script can be found here: **https://docs.google.com/document/d/1-XjdOncdnyGzIWFKUeVAIutvAL3GWIDf9l8a9OMRyTQ/edit?usp=sharing**

It is borrowed from this template:
https://docs.google.com/document/d/16LT1neIdtlIz6sQonw574QI9lHzRirAPT5DKT-gboJM/edit?usp=sharing

Promotional ideas

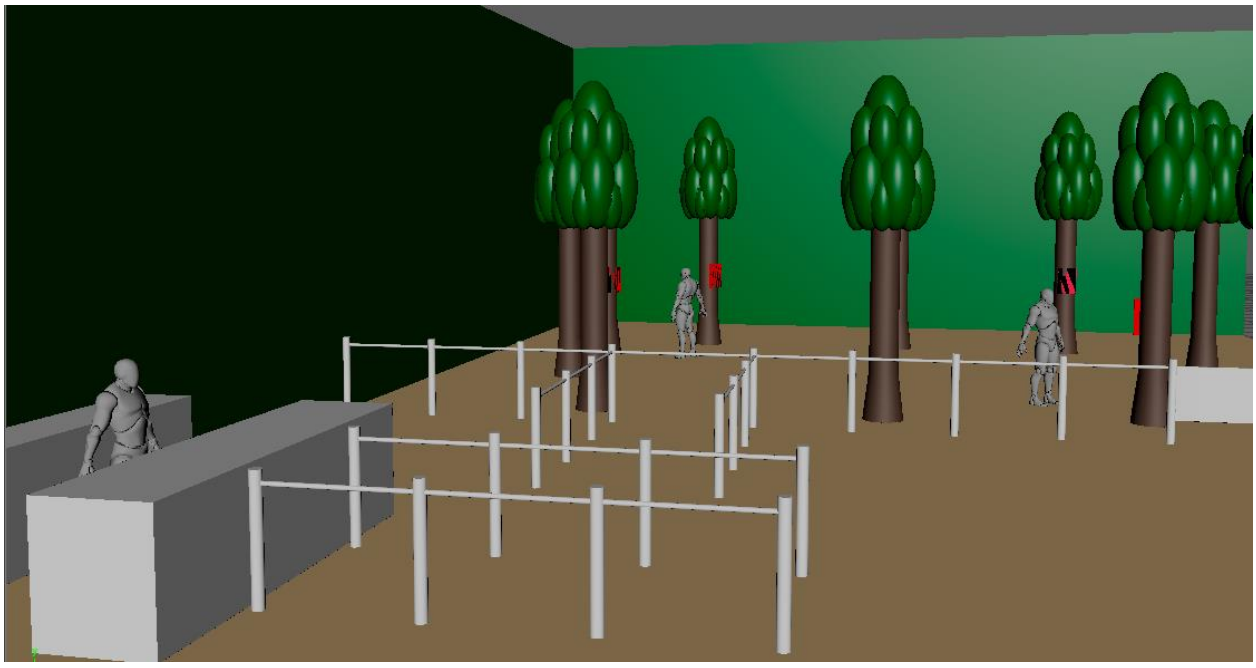
To further spread our goal of motivating more people to visit Botanic Gardens, we decided to brand ourselves, Botanic Gardens AR, and to have a potential booth to spread the name of our game and Botanic Gardens.

As by having booths, it could expand our network give new potential leads for our app (expodisplayservice, n.d.), which could make our app continue running and get big through those leads, which will in turn, when our app gets bigger and or more well known through those leads, it makes Botanic Gardens more well known as well, making more people to visit it

Logo

The logo is made using the shape of a leaf using the word 'Botanic' which is the main name of our team and game. A leaf isn't complete without its stem, so we made use of the stem space to make it known that our product is an AR Game.

Booth Prototype & Idea

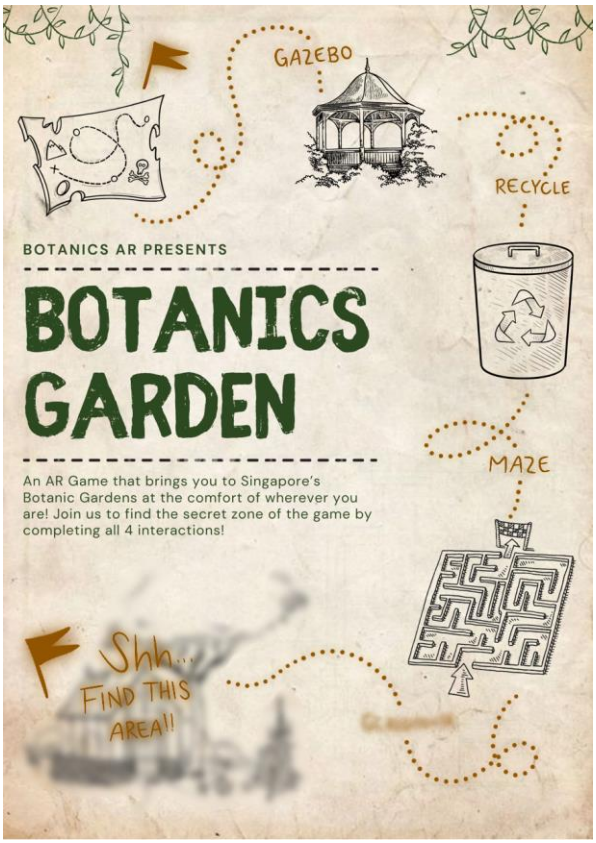


The main idea in mind is that we make our surroundings look like a park itself. Be it having a backdrop of a forest or even having miniature sculptures of trees and what belongs in the forest. We also want to make sure that the guests of the booth have a space that is unobstructed for them to walk around, scan our AR Image target. Keywords are Immersive, Green, Nature, Safe & Unobstructed.

We also had an idea where we would give out promotional pamphlets about our game and the pamphlet can double as a compilation of our image targets, where they can use the pamphlet to scan our image targets to play our game. Then they could bring the pamphlets home and play it at home

The pamphlet holders could also be on theme, similar to these, so that people may remember us better due to our creative approach

Promotion Poster

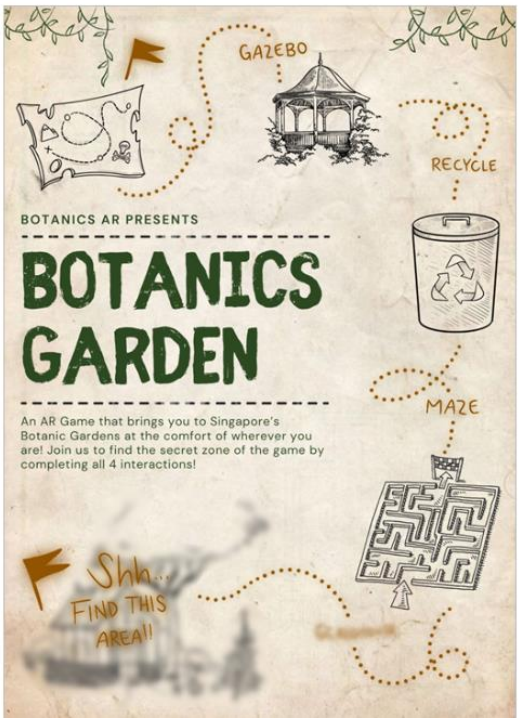


We want to go for a treasure hunt map since it gives the feeling of exploring each area to unlock and get the "treasure" which is the greenhouse area.

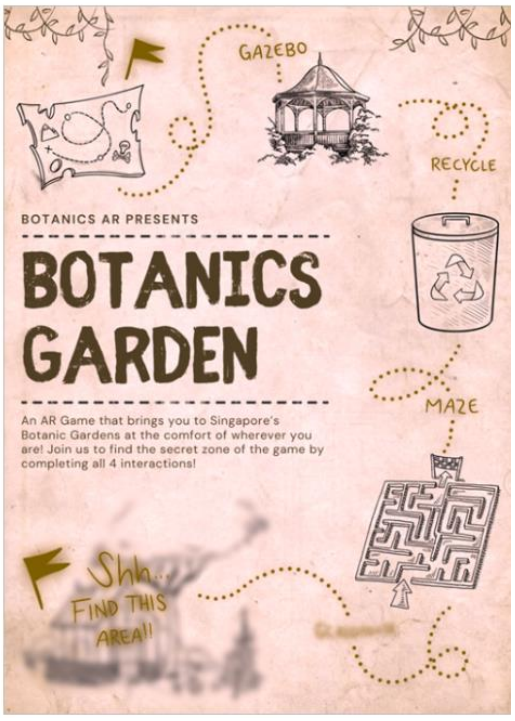
Secondly we went with a hand drawn sketchy aesthetic similar to our UI in the game, where we picked this style, so it feels more natural and not artificial which should be so for a nature like game.

Additionally, our poster is also color blind friendly, since we want to be inclusive to those who are color blind. We simulated this in the picture below.

Original



Simulated



References

bdadyslexia. (n.d.). *Creating a dyslexia friendly workplace*. Retrieved from bdadyslexia: https://www.bdadyslexia.org.uk/advice/employers/creating-a-dyslexia-friendly-workplace/dyslexia-friendly-style-guide#:~:text=Use%20sans%20serif%20fonts%2C%20such,may%20request%20a%20larger%20font.

Botanic Gardens. (n.d.). *Tyersall Entrance*. Retrieved from npal: https://www.nparks.gov.sg/sbg/our-gardens/tyersall-entrance/the-learning-forest

C.R, V. (n.d.). *10 Best Practices on Mobile Game UI Design that Actual Gamers Love*. Retrieved from DCI: https://www.dotcominfoway.com/blog/10-best-practices-on-mobile-game-ui-design-that-actual-gamers-love/#gref

Chin, M. (2023, December 19). *The story behind the production of "Magical Forest"*. Retrieved from Medium: https://www.8thwall.com/designium/magical-forest

ClintonEye. (n.d.). *COLOR BLINDNESS IN CLINTON*. Retrieved from ClintonEye: https://clintoneye.com/services/color-blindness/#:~:text=Facts%20about%20Color%20Blindness%20and,are%20color%20blind%20(8%25).

Color Column: Violet. (n.d.). Retrieved from Nix Sensor: https://www.nixsensor.com/blog/color-column-violet/#:~:text=The%20color%20purple%20is%20often,mystery%2C%20independence%2C%20and%20magic.

Darch, A. (2023, October 21). *Green Therapies: Exploring the Impact of the Colour Green on Emotional and Mental Health*. Retrieved from silvotherapy: https://silvotherapy.co.uk/articles/why-green-makes-us-feel-good#:~:text=Green%2C%20with%20its%20connection%20to,and%20a%20sense%20of%20security.

expodisplayservice. (n.d.). *The Benefits of Promoting Your Brand with Trade Show Booths*. Retrieved from expodisplayservice: https://www.expodisplayservice.com/the-benefits-of-promoting-your-brand-with-trade-show-booths/#:~:text=Finding%20Real%20Leads&text=Each%20visitor%20can%20be%20a,get%20is%20also%20pretty%20high.

GiantLazer. (n.d.). *Planet Stories AR – immersive mobile game about nature conservation*. Retrieved from GiantLazer: https://giantlazer.com/planet-stories-ar-game/

Magical Forest. (n.d.). Retrieved from 8thWall: https://www.8thwall.com/designium/magical-forest

Makan, D. (n.d.). *15 Tranquil Gardens & Parks in Singapore*. Retrieved from Holidify: https://www.holidify.com/pages/gardens-in-singapore-569.html

National Eye Institute. (n.d.). *Types of Color Vision Deficiency*. Retrieved from National Eye Institute: https://www.nei.nih.gov/learn-about-eye-health/eye-conditions-and-diseases/color-blindness/types-color-vision-deficiency#:~:text=The%20most%20common%20type%20of,of%20green%20look%20more%20red.

nparks. (n.d.). *Japanese Garden*. Retrieved from nparks: https://www.nparks.gov.sg/juronglakegardens/explore-our-gardens/attractions/japanese-garden

Oentoro, A. (2022, October 20). *How to improve UI/UX in mobile games*. Retrieved from BuisnessOfApps: https://www.businessofapps.com/insights/how-to-improve-ui-ux-in-mobile-games/

Payne, S. (2020, December 9). *UI Design for Color Blind Users*. Retrieved from Boldist: https://boldist.co/usability/ui-design-for-color-blind-users/

PUNCHev Group. (2023, May 17). *Designing For Mobile: UX Considerations For Mobile Game Development*. Retrieved from LinkedIn: https://www.linkedin.com/pulse/designing-mobile-ux-considerations-game-development-punchevgroup/

Shaffer, J. (2016, April 20). *5 Tips on Designing Colorblind-Friendly Visualizations*. Retrieved from Table AU: https://www.tableau.com/blog/examining-data-viz-rules-dont-use-red-green-together

Springer, A. (2022, August 20). *COLOR PSYCHOLOGY FOR EDUCATION: HOW DOES GREEN ENHANCE THE LEARNING ENVIRONMENT?* Retrieved from Artcobell: https://www.artcobell.com/blog/color-psychology-for-education-green#:~:text=It%20is%20a%20color%20that,creative%20thinking%20in%20classroom%20settings.

Staats, R. (n.d.). *7 Ways you can improve color accessibility for color blind users*. Retrieved from SecretStache: https://www.secretstache.com/blog/designing-for-color-blind-users/

Tan, K. (2021, April 9). *Singapore Botanic Gardens' New Glasshouse Attraction Has A Cold Ethereal Forest & 'Secret Ravine'*. Retrieved from TheSmartLocal: https://thesmartlocal.com/read/tropical-montane-orchidetum/

tripadvisor. (2024). *Gardens in Singapore*. Retrieved from tripadvisor: https://www.tripadvisor.com.sg/Attractions-g294265-Activities-c57-t58-Singapore.html

Turner, A. (2023). *How Many Android Users Are There? Global and US Statistics (2024) (Source: https://www.bankmycell.com/blog/how-many-android-users-are-there)*. Retrieved from BankMyCell: https://www.bankmycell.com/blog/how-many-android-users-are-there#:~:text=Globally%2C%20Android%20takes%2070.94%25%20of,to%20be%20Android%20smartphone%20users.

UNESCO. (2015). *Singapore Botanic Gardens*. Retrieved from UNESCO: https://whc.unesco.org/en/list/1483/

Wildeverse. (n.d.). *Wildeverse*. Retrieved from Wildeverse: https://www.wildeversegame.com/

Willings, C. (n.d.). *Teaching Students with Visual Impairments*. Retrieved from teachingvisuallyimpaired: https://www.teachingvisuallyimpaired.com/font-legibility.html

WWF. (n.d.). *WWF Forests - Immersive augmented reality app brings the forest into your home*. Retrieved from WWF: https://www.worldwildlife.org/pages/wwf-forests